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ENGINEERING AND MINING JOURNAL

October 29, 1921

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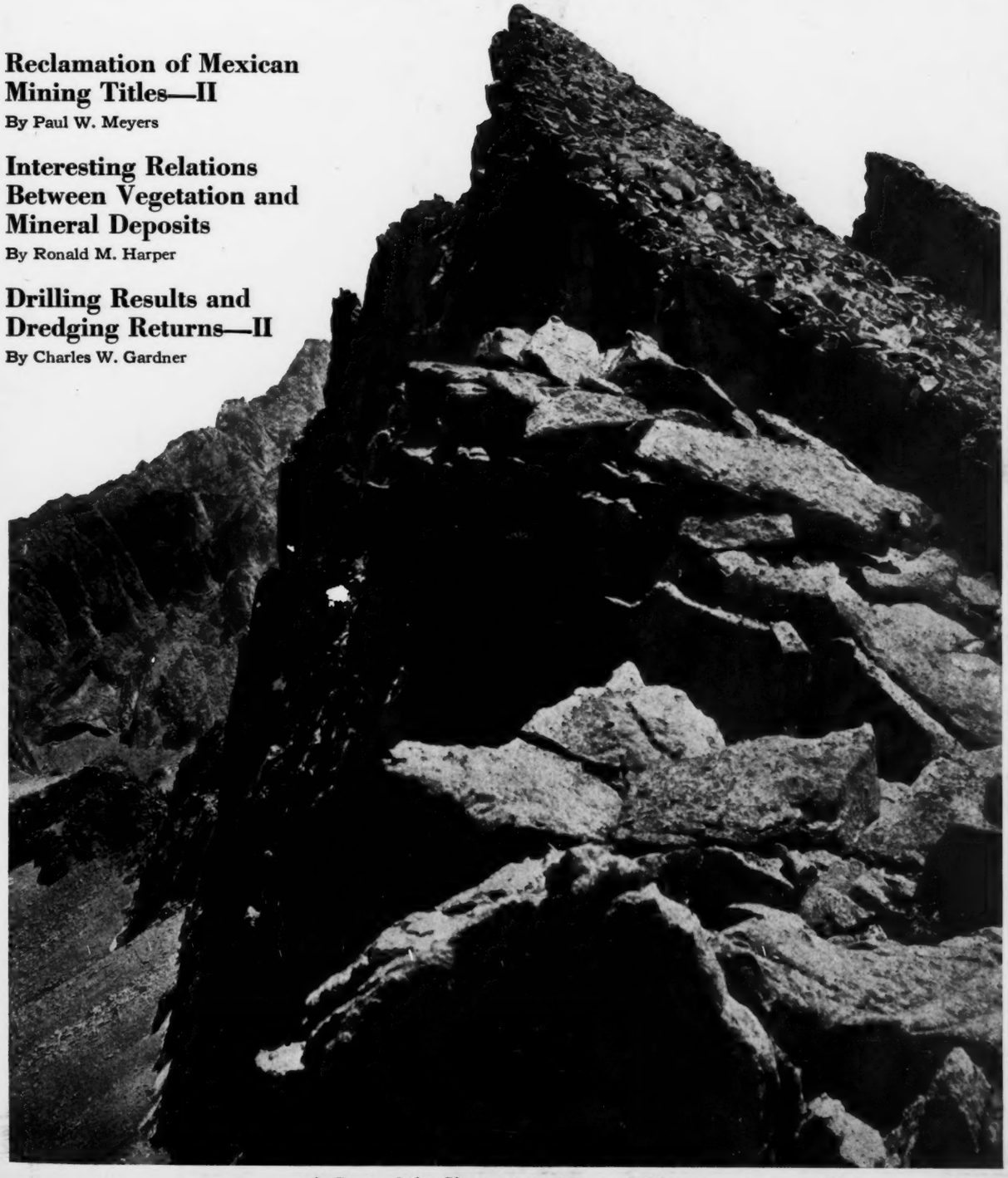
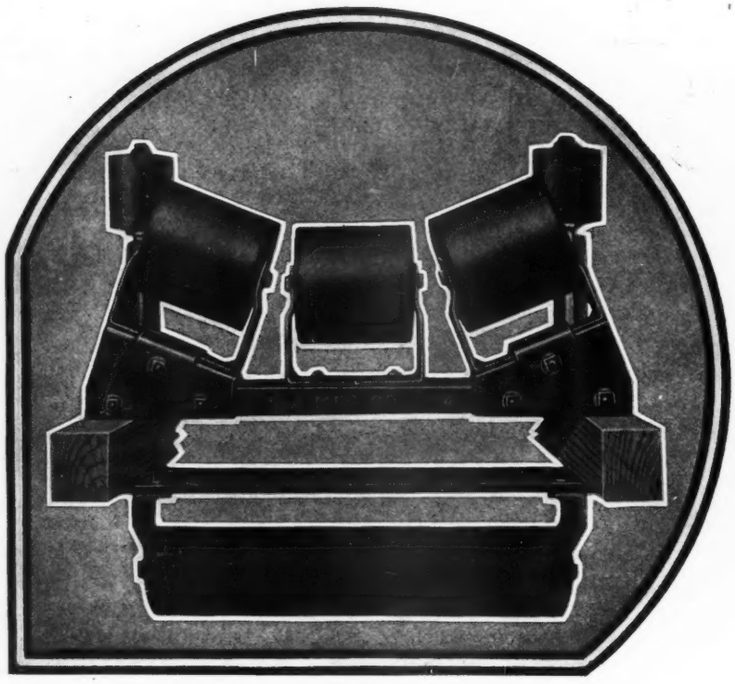


A Crag of the Sierras near Mount Whitney
Photograph by our Western Editor



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A Weekly Journal of the Mining and Mineral Industries
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Volume 112 **New York, October 29, 1921** *Number* 18

Importance of the Mineral Industries

THE RAILROADS of the country carry material classified as products of mines amounting to over one-half of the total freight; and this is true even during this period of great depression of the mining industries. During the quarter ended June 30, 1921, out of a total of 222,000,000 tons of freight carried, mineral products constituted 124,000,000. Out of this last figure, most considerable, of course, is the proportion of coal and coke, amounting to nearly 89,000,000 tons; clay, gravel, sand, and stone amounted to nearly 23,000,000, and iron ore to nearly 9,000,000 tons. Crude petroleum amounted to something over 1,000,000 tons, leaving other mineral products counting up to over 2,500,000 tons.

Compare these figures with the freight representing products of agriculture, which amounted to 21,000,000 tons; of animals and products, nearly 6,000,000; of forest products, nearly 20,000,000, and of manufactures and miscellaneous, totaling nearly 42,000,000 tons. This relatively vast tonnage of mineral products goes into a multitude of industries, of which it constitutes to a large degree the raw materials, or supplies the energy to turn the wheels of industry, either directly or through the medium of electricity. The proper development of our mineral resources, their wise encouragement, their sane conservation, is a problem second to none in importance for our statesmen.

How shall this best be worked out and administered? At the present time there is no attempt to do so, no Government organization which is allowed fully to cover the field. The war revealed our lack of preparation and of knowledge, the lack of any conception anywhere of the mineral problem as a whole; and the result was costly and dangerous. The agricultural products are the special charge of a Government department, the Department of Agriculture, which is most useful and necessary. Similarly, the mineral bureau of our Government should be grouped into a Department of Mines. This is the greatest single act which could be contributed to the advancement of the problem. Many people object to this plan—and rightly—because they fear anything in the way of expanding Government expenditures. The change could be made with very little additional expense. After all, it is not so much expenditures as organization which is effective in producing results; and the proposed department is merely a demonstration of wise organization.

The Problem of the Publication Society

AMBITIOUS MAGAZINE-PUBLISHING plans of the American Society of Civil Engineers were discussed editorially in the *Engineering News-Record* last year, and as the mining industries are cognizant of similar plans on the part of the mining societies, the considerations set forth concerning this similar problem are of interest to these industries and to the members of these societies.

Attention was first called to the fact that the stated object of the society is "the advancement of engineering knowledge and practice, and the maintenance of a high professional standard among its members," and that the methods of accomplishing this purpose have been by discrimination in admitting members, by the presentation and discussion of technical papers, and by committee work.

The society at that time was planning to abandon the publication of *Proceedings* and to substitute therefor a magazine, and to solicit advertising. The mainspring of this decision is stated in this editorial to have been the need of more revenue—colloquially termed the pursuit of the dollar. To get money they must have advertising; to get advertising they must publish a varied, timely, and not too technical magazine. Up to date no decision has been made by the society.

The *Engineering News-Record* queried whether such a commercial venture in the magazine field is fitting for a scientific society:

"The incompatibility of magazine publishing with the conduct of a society appears at many points. Take, for example, the matter of editorial comment. Whose opinion shall be expressed? We have in the past been treated to sharp conflicts even on technical matters which, it would appear on the surface, could be settled by a clear presentation of 'facts.' For the best accomplishment of the society's object a judicial habit of mind and a calm course are desirable—something that will not be encouraged if the society decides to take editorial positions, with the certainty of ensuing controversy.

"The incompatibility appears also in the matter of advertising. Is there not a fine distinction conferred by aloofness from commercial considerations, a distinction inseparable from high professional standing? We believe that there is, and the fact that the other societies do not believe so does not prove the case against us. The American Society of Civil Engineers stands second to none in prestige. The character and appearance of its *Proceedings*, the discrimination it has exercised in the admission of members, the carefulness of its public expressions, the quality of its committee work, have stamped it with a distinct and enviable personality. Will the society retain that personality when advertising salesmen are peddling the society's wares? What will be the society's standing if the publication committee's query, 'Shall an intensive campaign for advertising be inaugurated,' be answered in the affirmative?

"It should not be necessary to discuss the disturbing effect of the commercial attitude further. Engineers have always recognized a very distinct cleavage between professional and commercial thinking. The two are

incompatible. You cannot serve two masters. When advertising revenue becomes big, larger than the dues, let us say, to which phase of the work will the executives of the society give the greater attention?

"Yet another thought is warranted on this important subject—or rather on this *critical* subject, because it involves the entire future attitude of the society. So far has this matter of publishing been carried by certain societies that the expression 'publication society' has been coined. To help the thinking in this direction the extreme case of the National Geographic Society is cited. Any one may become a 'member' of this body by subscribing $3.50 a year for a magazine. It is distinctly devoted to the 'dissemination' of geographical knowledge, but is not distinguished for work in the 'advancement' of geographical knowledge. It is regarded generally as a publishing organization, not as a scientific society."

We commend this problem to the members of the American Institute of Mining and Metallurgical Engineers.

Standardization of Rock-Drilling Machines

ONE OF THE MARKED ADVANCES in mining, as well as in other industries, is the tendency toward standardization and the efforts that are being made to reduce unnecessary expense and diversification and duplication of exertion. There are, no doubt, many instances where standardization is applicable, but in which it has not yet been accomplished in mining, milling, and metallurgy. We have heard much of the "standard" round, sizes of drifts and raises, ventilation, hose fittings, and many other classifications. Where such methods have been put into practice after a thorough trial they have been found to be of advantage and well worth the effort required.

Webster defines "standardize" as follows: "To reduce to, or compare with, a standard; to determine the strength, scale value, etc., of, by comparison with some standard." "Standard" is understood as "the term officially applied to manufactured or prepared articles legally required to conform to specified conditions as to proportions of material."

Contrary to some opinions, a "standard" does not necessarily mean that there should or will be a cessation of effort when a standard has been decided upon. Rather the reverse, for it implies that the practice, machine, or article has been found to present the best performance under a certain set of conditions, these having been determined after experimentation and trial, so that necessarily with altering conditions new standards must be set up.

There is, however, a limit to the extent to which attempts at standardization should be carried. For instance, suppose the automobile manufacturers or the auto-buying public should decide that all motor cars must conform to certain specifications. We can imagine into what chaos the industry would fall and the dissatisfaction that would be caused on every hand. Incredible—such an idea—of course. True, each particular type of car now conforms, within certain limits, to those of similar manufacture, so that there exists an interchangeability of parts, which is the best that can be hoped for unless a throttle is to be placed on the inventive genius of motor car and engine design.

A subject under recent discussion is that of the standardization of parts that enter into the construction of rock-drilling machines. Primarily, the manufacture of drilling machines is highly specialized, requiring a nicety of design, excellence of materials, and careful workmanship. The development has been slow, but has reached the stage today where considerable rivalry exists among the various manufacturers. That they are keenly aware of the needs of the mine operator is evident from the variety of models that are offered.

We have already stated in these columns that mining men and drill manufacturers are agreed that there is no one "best" type of drill bit for every purpose, and this is true also of the "power behind the drill," or the drill machine. Each particular kind of "drilling" rock requires its own particular type of machine. Some operators swear by this make of machine, others by that, so that already a rivalry, which is comparable in few other fields, has been established among drill-machine manufacturers. Such a state can be regarded as a valuable asset to mining, and should be encouraged, for it provides against stagnation of drill-machine design and furnishes the proper incentive for further research and invention.

Obviously, standardization has limitations, and it would seem that the design of rock-drilling machines should, for the present at least, remain on the exempt list.

The Metric System Bill

THE RECENT HEARINGS in Washington on the Ladd bill for the compulsory adoption of the metric system brought out a great deal of testimony in favor of the system as compared with the clumsy English system of weights and measures. The senators who are conducting the hearing were impressed with the gain in efficiency which results from metric usage, and with the views of some that it could be introduced without great upheaval. The president of the Haynes Automobile Co., for example, found no great difficulty in converting machines to metric measurements, and added, "Nearly all research work is done in the metric system. Our industries are dependent upon the research work of our scientists. They work in the metric system because it is simple, more logical, and can be handled with much greater facility. I favor very decidedly the adoption of the metric system."

The main question, therefore, in Congress and out, is the most practical way to expedite a needed change. Should the Government let it alone or take a hand in it? If it should undertake to assist the introduction of the system, what should it do, and how far should it go? The word "compulsory" does not sound good to us, or to any one else. It sounds good only to the compeller, not to the compelled, or the about-to-be compelled. It breeds prejudice and resistance. And so it should. Therefore, we believe that the sentiment is, and should be, against compulsion. Let a man use the Chinese or the Turkish system if he wants to. He has a constitutional right to. But there are a thousand gentle and helpful ways in which the Government can lead, influence, and subtly direct. It can set a good example in its own business, by employing efficient methods, of which the metric system is generally conceded to be one. Already there is an enormous use of the system in this country. Only it has not yet gravitated into common use, the last fortress of habit and tradition. The working down of the leaven could be assisted with very little if any unpleasant disturbance, and with no compulsion.

Riotous Taxation

ONE OF THE MOST VEXATIOUS mine-taxation problems is that where a large mine employs so many workmen that a whole town is supported, and the municipal government of this town of employees, by virtue of their right to levy taxes to any amount, run riot in plundering the company (which is the source of all revenue, and the sole foundation of all prosperity) by exorbitant taxes, which are spent most extravagantly. News comes from Ironwood, on the Gogebic Range, that the city is increasing its tax rate 30 per cent over that of last year, to a rate of $5.20 per $100. The mining companies pay 80 per cent of the taxes, and, therefore, this increase is apparently merely a sandbagging of the mining industries, against which the law so far seems to have provided no recourse.

Most of us have seen and marveled at the iron-mining town of Hibbing, on the Mesabi Range, with its lavish clustered electric lights on its fastidiously paved streets, and its palatial school buildings. All this is mulcted from the local mines of the U. S. Steel Corporation as local taxes. If it were not for the mines there could be no town. Father is rich, and he can pay, and the community of iron-mine employees, with the tradesmen who live on the earnings passed on to them, hold him up without a thought of economy or efficiency. They leave that to the mining engineer and the mine manager.

Liberty is a great thing; and the liberty to tap your neighbor's pocketbook is a sweet and pleasant thing; but it does not look or sound like Liberty to your neighbor. He would spell it differently.

Nitrogen Gas in Metal Mines

A BODY OF HOT NITROGEN gas in one of the lead-silver mines of the East Tintic mining district, Utah, reported by the Bureau of Mines,[1] is considered to be a residual atmosphere, due to the abstraction of oxygen from air through the rapid oxidation of sulphides. The resulting nearly pure nitrogen gas (the samples analyzed ran over 99½ per cent nitrogen), being lighter than air, accumulates in the top of raises and stopes, with a level sharp line of separation from the mine air below. The gas had a temperature of 175 deg. F., though the air three feet below was only 120 deg. F., and at one foot below, 135 deg. A candle or acetylene light raised into the gas is extinguished; and the gas, of course, cannot be breathed.

Similar accumulations of nitrogen gas have been reported from various mining districts, as, for example, in Tonopah. They have usually been considered as igneous emanations, from cooling igneous rocks far below—the last superficial demonstration of the igneous activity with which the ore deposits are genetically connected in all these camps. The explanation offered in the article under consideration, that the gas is residual air-nitrogen resulting from oxidation of sulphides, is an interesting alternative explanation; but no proof of this is given, and it would require clear demonstration to show why these gases are only rarely met with, though oxidation processes are universal; further, why these gases occur where there has been no conspicuous oxidation, as was the case in the West End mine, at Tonopah.

[1]McElroy, G. E., *Reports of Investigations*, Bureau of Mines, Series No. 2282.

WHAT OTHERS THINK

Peripheral Discharge From Ball Mill A Patented Feature

On page 579 of your issue of Oct. 8 is a description of a "Convenient Laboratory Ball Mill" (conical mill). The principle involved in a peripheral discharge from the conical mill I have patented in the United States, Canada, Mexico, as well as in many foreign countries, and further patents are pending. Up to the present we have only made sizes ranging from 20 in. to 72 in. in diameter. The 20-in. diameter mill, however, might be a little too large for ordinary laboratory tests. Hence it would be better to adopt the size suggested by Mr. Fahrenwald. The mills we construct for this purpose are used for wet and dry grinding, either as "batch" or continuous-discharge grinders.

To expatiate further upon what Mr. Fahrenwald says about the efficiency of this laboratory mill would be a little like "throwing bouquets" to one's self, for Mr. Fahrenwald is correct in all he says about the efficiency of this mill.

We appreciate the value of this small grinding unit for laboratory use, and also the benefit that is being conferred upon us by its use in any instruction laboratory. The Hardinge company, however, must be consulted before the construction or use of such a mill will be permitted. This permit has been granted the University of Idaho. The Columbia University's Mining School has in its laboratory a conical mill of two tons per hour capacity fitted with a peripheral discharge for the purpose cited.

H. W. HARDINGE.

New York.

Mr. Hubbard and the Black Lake Asbestos Mines

In your issue of Sept 3 you published an article by me entitled "The Black Lake Asbestos Area" which called forth a rebuttal by Mr. C. C. Lindsay.

Mr. Lindsay's article, although very clever, confines itself to a discussion of my personal character and mental attainments rather than my article. In only one place, the paragraph concerning the French Canadians, and their relation to the work being carried on there, does he challenge my statements as to the facts directly.

His fourth paragraph, which deals with steam shovels, inclined planes, cranes, and other apparatus, concerns Thetford mines, not Black Lake. Inasmuch as he sums up his article with the words, "has had only slight experience in one small portion of it," i.e., the asbestos field, I do not think this is fair evidence, as my article was explicitly confined to a discussion of the Black Lake area alone, and I was under the impression that this was made perfectly clear in the article.

Therefore I challenge Mr. Lindsay or any others in this field to publish statements, tables, or reports which will prove my statements incorrect. Such facts, however, should be drawn from the Black Lake mines and not from Thetford mines, Danville or East Broughton.

WYNANT D. HUBBARD.

Black Lake, Quebec, Canada.

The Mining of Salt in Louisiana

Photo from Ewing Galloway, New York

SHAFTHOUSE AND MILL OF MORTON SALT CO. AT AVERY'S ISLAND, LA.

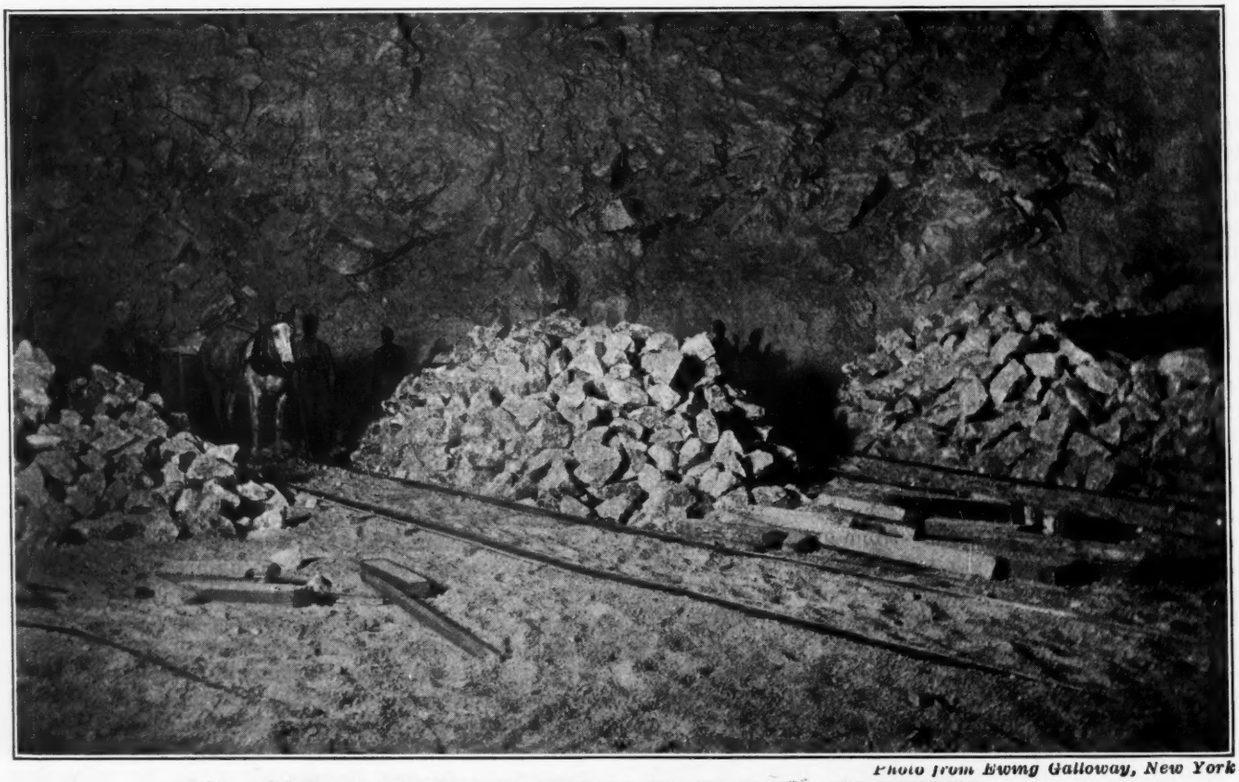


Photo from Ewing Galloway, New York

ROCK SALT PILED IN STOPE READY FOR TRAMMING AND HOISTING

The Reclamation of Mexican Mining Titles—II

The Question of Forfeiture of Rights to American-Owned Mining Properties Through the Difficulties and Uncertainties of Paying Taxes Under Revolutionary Conditions, With Some Further Suggestions on the Subject of Reclamation

BY PAUL W. MEYERS
Written for *Engineering and Mining Journal*

IN MY ARTICLE in the Sept. 10 issue of *Engineering and Mining Journal*, I enlarged upon a suggested plan by which Americans might undertake to reclaim their mining titles in cases in which forfeiture for non-payment of taxes has been declared by the government of Mexico and new claimants have relocated such properties in violation of the decree of March 31, 1917. Under this decree, mining properties of proved value were specifically reserved from simple relocation, and provision was made for taking up such properties by means of lease contracts with the Mexican government. Since the preparation of the former article, the United States Government has informally requested the government of Mexico to issue a regulation based on the decree of March 31, 1917, which will permit former owners to reclaim their titles upon proving the industrial value of their properties and paying the accumulated taxes, without the Mexican government taking recourse to the article of the said decree, providing that such properties should be submitted to public bidding for lease contracts, obliging former owners to bid in competition with others in order to secure possession of their properties under leases.

It is to be hoped that the Mexican government will accede to this request, but it is evident that before restoring the validity of former mining titles the Mexican government may require former owners to show cause for their omission to keep their taxes paid up, as an article in the present mining code of Mexico provides that the government cannot revoke its former acts in declaring forfeitures of mining titles unless just and legal cause is shown for such revocation.

FORFEITURES DUE TO REVOLUTIONARY CONDITIONS

Broadly speaking, the revolution should be considered as sufficient cause for the non-payment of mining taxes by Americans who were driven from Mexico by conditions over which they had no control. In other words, a case of *force majeure* existed in Mexico from 1910 to 1920, and I contend that ten years of revolution should, in equity, be sufficient ground. The government of Mexico has already given indirect recognition of the practical difficulties which stood in the way of keeping up the payment of mining taxes during revolutionary conditions, the latest decree which recognizes this fact having been promulgated on Aug. 28, 1920, which permitted the payment of accumulated mining taxes, without penalties, on an installment basis, provided such payments were begun prior to Nov. 1, 1920. Many Americans availed themselves of the privileges of this decree, but such privileges were applicable only to properties on which the Mexican government had permitted the taxes to accumulate without imposing the penalty of forfeiture of title. Therefore, it naturally follows that this decree was of benefit only to owners of properties which had not attracted the attention of relocators.

In all cases where speculators had taken advantage of conditions by securing the forfeiture of titles to properties which they desired to acquire at the nominal cost of relocation, the decree did not apply. Mining properties of known value had already been singled out and their titles cancelled, and few properties of material value remained subject to the benefits of the decree of Aug. 28, 1920. As pointed out in my preceding article, it was the custom of the Carranza government not to disturb mining titles on which taxes were in arrears except upon the special application of some one desiring to obtain possession of the properties, in which case it would formally declare the title forfeited for non-payment of taxes and thus permit the applicant to proceed with his plans for relocation. This discriminatory method of imposing the penalty of forfeiture of title naturally inflicted injustice upon the owners, and especially upon Americans who had been driven from the country by the revolution and warned to stay out by their own government, uncertain as to which faction they should pay their taxes, and without facilities for safely effecting the payments.

UNCERTAINTY IN PAYING TAXES

Mining taxes in Mexico are payable either at the local mining office in the district in which the mine is situated, or directly to the Treasury Department in the City of Mexico. Before the revolution it was the universal custom to make such payments to the local offices. During the revolution, when mining districts were occupied successively by partisans of different factions, the matter of paying these taxes became involved in danger and uncertainty. In April, 1913, soon after the Huerta administration had obtained control of the capital, the United States Government served notice upon the Huerta government that it would consider payments of taxes by Americans to *de facto* authorities having control of local offices as completely relieving mine owners of all responsibility in the payment of their taxes, following the generally accepted usages of international law regarding civil wars and *de facto* control of regions. At about the same time, the Huerta government offered to accept payments by check if made direct to the Treasury Department in the capital, and American mine owners were permitted the choice of making their payments under protest, and usually under great difficulties, to local *de facto* authorities, or to remit by check to the Treasury Department in Mexico City. While the advice of the State Department rather inclined to favor the former method, probably because of its policy of non-recognition of the Huerta administration, it was only natural that Americans should favor the latter method as providing the lesser risk. In this way many Americans became accustomed to making their payments in the capital, even though threatened with repudiation of such payments by Carranza as head of the Constitutionalists.

The Huerta government fell in July, 1914, and the question of what constituted a legal government in Mexico, competent to receive taxes from foreign property owners, became still more acute, this situation continuing until August, 1915, when, following the occupation of Mexico City by the Constitutionalist forces under Pablo González and the installation of Carranza, order was restored in the capital. This was followed, on Oct. 19, 1915, by the recognition of Carranza as the chief executive of the *de facto* government of Mexico by the United States.

As is well known, the restoration of order in the capital was not followed by the restoration of order throughout Mexico. Various factions remained in control of large areas of Mexico, holding them in opposition to the Carranza government, and this situation continued through the several years during which Carranza remained in control of the central government. Organized factions in opposition to the central government ceased to exist only in 1920, following the overthrow of the Carranza government and the establishment of order by General Obregón and his adherents.

It was during the extended period in which the Carranza administration remained in control of the central government that the large majority of mining titles were declared forfeited for non-payment of taxes. Although the Carranza government received the full recognition of the United States during this period, at no time was it in control of the country, and at no time were Americans free from uncertainty as to the continuance of this government, while the whip was held over the heads of all owners of mining properties by means of the unjust decree of Sept. 14, 1916, requiring operation of mining properties under penalty of forfeiture of title.

It will be freely admitted that the general attitude of the Carranza administration was anti-American and that owners of properties in Mexico were under constant threat of losing them through the promulgation of some decree with which it was impossible to comply, or through the collapse of the Carranza government and repudiation of its acts by its numerous opponents. Therefore, in my opinion, payments of taxes to the Carranza administration imposed a gamble upon American mine owners unless the regions in which the properties were situated were definitely occupied and controlled by Carranza's forces under such conditions of security as to remove them from the possibility of having such regions occupied at any time by the forces of other factions.

THE LEGAL QUESTION

This subject of "regional control" is the crux of the question. *I am firmly of the opinion that all declarations of forfeiture of titles of mining properties made by the Carranza government in the capital, when such properties were situated in regions not definitely occupied or controlled by the Carranza forces, were not only contrary to the spirit of the attitude assumed by the United States on this point, but illegal under generally accepted principles of international law regarding de facto governments, and also under Mexican law as it existed at the time.*

On June 19, 1915, while Carranza was still in Vera Cruz, he promulgated a decree containing three articles: The first, in effect rescinding a preceding decree in which he had declared that all payments of taxes to

A MEXICAN CARTOON DEPICTING THE RULERS OF MEXICO FROM 1910 TO 1920

Name	Term of Office and Date of Assuming Control
General de Division Porfirio Diaz. ...	32 years, 5 months, 25 days.
Licenciado Francisco Leon de la Barra.	5 months, 15 days, May 25, 1911.
Francisco I. Madero.....	1 year, 3 months, Nov. 6, 1911.
Licenciado Pedro Lascurain.....	45 minutes, Feb. 19, 1913.
General de Division Victoriano Huerta.	1 year, 5 months, Feb. 19, 1913.
Licenciado Francisco Carbajal.....	17 days, July 22, 1914.
Venustiano Carranza, como Primer Jefe	2 years, 10 months, Aug. 20, 1914.
General Eulalio Gutierrez.....	2 months, 10 days, Nov. 10, 1914.
Roque Gonzalez Garza.....	4 months, 24 days, Jan. 16, 1915.
Licenciado Francisco Lagos Chazaro..	1 month, June 9, 1915.
Venustiano Carranza, como Presidente	2 years, 11 months, 28 days, May 1, 1917.
Adolfo de la Huerta.....	6 months, June 1, 1920
General de Division Alvaro Obregón...	Dec. 1, 1920.

other factions were null and void; the second condoning the non-payment of taxes to other factions until his forces had occupied the respective places for a period of one month; and the third declaring that taxes paid in advance to other factions would not be recognized upon the occupation of the respective places by his forces. The text of these three articles is as follows:

Article I.—All taxes are condoned which the constituents may have been obliged to pay up to the date of the new occupation of each place or town by the Constitutionalist forces.

Article II. The accumulated taxes which are found to be pending at the date on which the occupation of the places by the Constitutionalist forces may occur, will be collected without any penalty, provided that the payment may be effected within one month following the date of the occupation. Such period once passed, the collection will be made with the legal penalties.

Article III. The Constitutionalist government will not recognize in any case advance payments made to the usurping authorities in the nature of taxes corresponding to a period prior to the occupation of the places by the Constitutionalist forces, and, therefore, all taxes corresponding to a period prior to the date of the occupation of the places will be collected independently, whether they may have been paid to the enemy authorities or not.

Under the terms of this decree, I believe the Carranza government had no legal right to declare the forfeiture of mining titles for non-payment of taxes when the properties were situated in regions where the so-called Constitutionalist forces did not definitely control in peace and security. It is evident, however, that during the administration of Carranza both his Treasury Department and his Department of Industry, Commerce, and Labor frequently violated both the letter and the spirit of this decree by declaring forfeitures for the benefit of interested parties.

I have made and caused to be made strong representations to the State Department at Washington on this point, as well as on the point embraced in my preceding article, but have been met by the difficulty that no definite plan appears to have been formulated as yet for the reclamation of American-owned mining titles in Mexico. Therefore, I present the results of my own experience in the hope that American mining people interested in Mexico may co-operate at this time in presenting a definite program and policy to Mexico through diplomatic channels.

WHAT CONSTITUTED CONTROL?

In this connection I have suggested as a basis for determining what constitutes occupation or control of any region, that the situation on Oct. 19, 1915, when the United States officially recognized the *de facto* government of Carranza, be taken as a starting point, and that the occupation or control of any region by the so-called Constitutionalist government should date only from the definite establishment of peace and order in all such regions, either by the death of the leader in opposition to the Constitutionalist forces and the complete submission of his followers, or by the execution of a treaty providing for submission to the Constitutionalist government which shall have been duly carried out. This would obviate the danger of any mine owner being required to present legal evidence of the exact military situation in his district at the time his property was declared forfeited, in which case his evidence might be controverted by so-called military reports of Constitutionalist leaders, and the whole subject be clouded by the changing fortunes of war and the indefinite character of the guerilla warfare which characterized so much of the fighting. In other words, it would not be just to place the burden of proof regarding temporary military situations upon the shoulders of mine owners who had been driven out by the general situation.

The general facts of widespread revolution, and the impossibility of foretelling during the revolutionary period between 1910 and 1920 which faction would emerge the victor and restore order throughout the country, should count as sufficient evidence in all cases except where the Mexican government could legitimately contend that peace and order had reigned continuously from the Constitutionalist occupation of the capital in August, 1915. It should be understood that the present administration of President Obregón considers itself as the Constitutionalist government under which the Carranza constitution of 1917 and all the laws, decrees, regulations, and orders of Carranza are given full force and effect.

A PROGRAM OF CO-OPERATION NEEDED

I cannot urge too strongly the opinion that now is the time for American mining people to get together on a definite program for reclaiming their rights and properties legitimately acquired prior to the revolution and now in grave jeopardy of being lost beyond recall. Should it not be possible to reclaim titles illegally declared forfeited and illegally relocated by others, it may at least be possible to fix the responsibility for their loss directly upon the Mexican government, where it properly belongs, and make such losses a basis for just claims for indemnification against the government of Mexico.

Eventually it is probable that a Claims Commission will be appointed mutually by the United States and Mexico, and, under general usage, claimants must show that they have sought and been denied justice by the government of Mexico before they are in proper position to collect claims through the United States Government. The time for seeking the reclamation of Mexican mining titles is right now.

Sulphur-Dioxide Leaching Tests Successful

Tests on the sulphur-dioxide leaching of complex ores from the Miami district in Arizona have been completed at the Southwest station of the U. S. Bureau of mines at Tucson. It is considered that sulphur-dioxide leaching is a demonstrated success on the most refractory siliceous ores in the Southwest and also on ores containing a large percentage of acid-soluble gangue. The commercial application of the process appears to hinge largely upon the successful working out of the manufacture of sponge iron. Laboratory work is being done on Walker River siliceous copper ore which has soluble lime, iron, and manganese, aggregating 10 per cent acid-soluble gangue. Results so far obtained are encouraging.

Investigating Theory of Flotation

Co-operative work by the U. S. Bureau of Mines and the University of Idaho on the theory of flotation is in progress at Moscow, Idaho. Some very interesting facts on the adsorption of oil by minerals have been developed, which will be published later in detail.

Drilling Results and Dredging Returns—II

Examples of Placer Operations in Various Parts of the World Indicate That Prospecting Data Must Be Intelligently Interpreted To Obtain Accurate and Reliable Estimates of Probable Gold Content and Recovery

BY CHARLES W. GARDNER
Published Exclusively in *Engineering and Mining Journal**

I BELIEVE it impossible for two engineers, each of whom has been furnished with exactly the same drilling data, independently to interpret the evidence available and reach the same conclusion as to the gold content in the ground, although they should agree closely as to the yardage.

The result from some holes will be obviously too high; other holes may be almost a blank, although in ground which adjacent holes indicate as carrying a fair gold content. Should the assay values of the high holes be reduced, and those of the low holes be increased? If so, by what an amount? Should the high holes only be considered and scaled down? If so, to what extent? Similar results will not be reached by the independent judgment of any two engineers. Even should the same engineer, after a lapse of time, revise his work without having access to his first figures, he will often arrive at a different conclusion.

The amount of yardage is also affected by the decision as to the depth into bedrock which the dredge should dig to recover all of the gold, and in deep ground as to the slope material which will be handled outside the bedrock line of dredgeable values.

Some engineers make a practice of reducing their original estimate 10 to 20 per cent in the computation of the figures to be presented in their report, and claim that this is done more to allow for defective recovery by a dredge than through a lack of confidence in their own judgment. There should be no radical difference of opinion between engineers as to the correct methods to be employed in making the estimates.

Attempts have been made by some engineers to formulate fanciful and mystical theories by which they strive to determine the average value of an aggregate number of drill holes, but such efforts are as useless as an attempt theoretically to revise the multiplication table. If a dredging area, prior to drilling, be laid out in squares of equal size (such a method being seldom or never employed), and then a drill hole be put down in the center or at the corner of each square, the average value of the holes so put down can be ascertained by first deciding on the value to be given each hole and then obtaining the average by common mathematical methods.

PREFERRED PROCEDURE

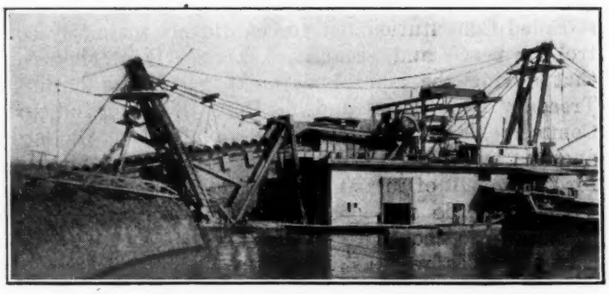
If the tract has been drilled with holes spaced at irregular intervals, they should be platted and triangles drawn connecting all of the holes. The area of each triangle should be figured and the average value of the three holes affecting it be applied to determine its gold content. The nearer the triangles are to being equilateral the more nearly correct will be the result.

If a deposit formed by a well-defined flow has been cross-sectioned by various lines of drill holes, the yardage and gold content in each section should be figured and the average of two sections be applied to the block of which they define the end limits.

Where holes are put down at random and no attempt is made to define accurately the area represented by each, there is no theoretical formula or known mathematical method that can be used to determine the correct average value of all of the holes.

CHOICE OF A CONSTANT INFLUENCES CALCULATIONS

Another factor which has a material bearing on the interpretation of drilling results is that of the constant used in calculating the amount of material displaced by the pipe. By the term "constant" is meant that figure which multiplied by the length of pipe driven will represent the cubic feet of material theoretically coming from the pipe and which is used to obtain the value of the gold content recovered and to ascertain the value per cubic yard of the ground. In some operations the constant and length of pipe are the sole factors used in estimating the volume of material from the pipe, but careful engineers measure in a box the amount of tailing, and make, when necessary, what they consider a proper adjustment of volume, particularly if the amount of measured material is greater than the theoretical.



NATOMAS NO. 8 DREDGE OF NATOMAS COMPANY OF CALIFORNIA

One of the first and, owing to its simple application, a very frequently used constant is that commonly known as the "Radford factor." It is 0.27, which represents 1 cu.yd. of material to every 100 ft. of 6-in. pipe. I do not know the origin of this constant, but as it closely approaches the area of a circle with a 7-in. diameter, I presume it was based on the assumption that the cutting shoe, when driven, would force material covering that area into the pipe. Later it was theoretically considered that as the cutting shoe had an external diameter of 7½ in., and an exterior cutting edge, it would displace, and there be forced into the pipe, its full area of 0.3068 sq.ft. The use of this constant is considered more conservative than that of the first, as by its application the theoretical gravel content figured as coming from the pipe is proportionally increased about

*Read at the September meeting of gold-dredge superintendents at Natoma.

13.6 per cent and the estimated value per cubic yard decreased about 12 per cent.

On some work the constant 0.33⅓ has been employed, and this assures still more conservative results, as in comparison with the first constant its use gives an increase in estimated gravel content of nearly 23.5 per cent and only about 81 per cent of the values.

Constants Affect Estimates

The importance of the difference will be realized when it is considered that if a tract of ground is estimated by the use of the first constant to contain $1,000,000, the amount will shrink to $810,000 if the latter constant be used. Estimates of some properties have been based on the use of the constant 0.30 as being simple and fairly conservative.

There is no common agreement as to the most correct constant, and different engineers adhere to the use of each, as they have not been able to decide, from the knowledge they possess of dredging results, which one is the best. In my opinion it will be impossible to determine on one applicable to all fields, as I believe the character of the material has an important bearing on the result attained.

In reporting the results as obtained by the use of an Empire drill, I will use the term "factor" as the figure representing the length of pipe equal to one cubic yard. The one in common use is 238. Mr. Prichard, in his report above referred to, states that on the Pato property he selected a dredged area in which he had previously drilled seventeen holes. He carefully calculated the area and cubic yards represented by each hole, and then, knowing the actual yardage and gold yield produced by the dredge, he determined mathematically the factor for the drill holes which, when applied, would equal the actual value recovered by the dredge, and found it to be 387. By the use of this factor the theoretical volume from the pipe would be 61.5 per cent of that estimated by using 238, and the values per cubic yard would be increased about 62.6 per cent.

An understanding of the facts set forth makes it possible more clearly to consider the difference between original estimates and actual dredge returns, and more fully to comprehend the reason that discrepancies exist.

Early Drilling Was Unsystematic

Unfortunately, the first few years of the dredging industry in California did not furnish comparative data of value. The ground as a rule was not drilled in a systematic manner, and on some properties one drill hole to about every ten acres was considered sufficient to indicate its value. The proper use of the drill was not understood, as its operator was gaining his first experience with it. It was sometimes the practice to drill below the pipe and then to use the sand pump as long as a color could be found in the tailing.

I remember visiting a drill operating in thawed ground near Nome and being afforded considerable amusement by the manner in which the work was conducted. I asked the drill man how far he was drilling below his pipe. He said he didn't know, but that it might be about time to find out, and after taking some measurements, he replied to my question, "Oh, I guess about nine feet or so."

Such loose and careless methods produced some astonishingly rich results, and these were the foundation of many an air castle built by property owners.

I remember one line of holes drilled in the early days which indicated an average value of 72c. per cubic yard, but when the ground was dredged it yielded less than 18c. per cubic yard.

Modern Dredges Make Better Recovery

Even if data were obtainable, comparison between the prospecting and dredging returns of the earlier period would be of little value, as one must consider the fact that the first dredges did not make a close saving of gold, owing to an insufficient area of tables, and that the buckets did not properly dump into the hopper. In modern dredges these defects have been remedied. The dredge of today makes a very close saving of all of the gold which will settle by gravity in the riffles.

One of the best comparisons between drilling results and dredge returns is obtained from the operations of a company whose property was systematically drilled and later equipped with two modern dredges. The deposit was the result of stream action, and lines of drill holes were run across the deposit at right angles to the flow. The blocks of ground between each two lines of drill holes, and defined on the sides by the limit of profitably dredgeable areas, were separately computed as to yardage and gold content. The upper portion of the property, consisting of 121 acres, having an average depth of 18 ft., has been completely mined. The original estimates gave the average value per cubic yard as 16.8c., and the value recovered by the dredge was 15.63c., or 93 per cent of the estimate. The constant used in computing the drill results was 0.33⅓, and had a constant of 0.3068 been used the estimated and actual values would have agreed closely. The lines of drill holes on this tract were spaced about 500 ft. apart, dividing it into eight blocks. The results from fifty drill holes were used in the computations, there being one hole to about every 2.4 acres.

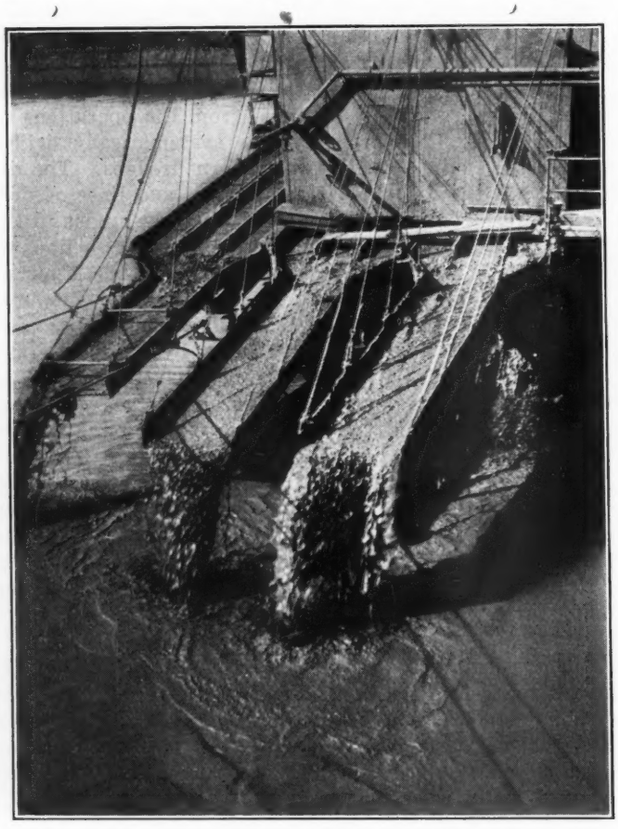
The comparative results from these various blocks varied greatly. In one block the recovered value per cubic yard exceeded the estimate by 49.4 per cent and in another block it was less by 68.2 per cent, making the closeness of the average results, obtained from the whole, the more remarkable.

An Example of Dredge Recovery Exceeding Estimates

There has been mined on the lower portion of this property an area of 480 acres having an average depth of 16 ft. Seventeen lines of drill holes were run across this area at intervals varying from 400 ft. to 700 ft. The results from 130 holes were used in making the estimates, or one hole to every 3.7 acres. The estimated average value per cubic yard for the whole area was 11.61c. and the dredge recovery 16.44c., or a gain of 41.6 per cent. All of the blocks returned a higher value than was estimated, but the difference between them was marked. The recovered value per cubic yard in the block at one end, which contained only two and one-half acres, exceeded the estimated value by 99.2 per cent. One block of fifty-five acres exceeded the estimate by 82.7 per cent, and in another block of eight and one-half acres the excess was only 4.3 per cent. The percentage of gain in the other blocks ranged between these amounts. The yardage in the whole area was 10.1 per cent greater than that estimated, owing to the dredge digging outside of the estimated side limits and a little deeper into the bedrock.

The work on both tracts was done under the supervision of the same engineer, but with different drill crews. The character of the deposit was about the same on both areas, but with a larger proportion of hard bedrock on the upper tract. The gold was concentrated within a few feet of bedrock and was fine in character, with no nuggets. The reason for the comparative difference in results is unknown.

On one property which was drilled many years ago 180 acres had been dredged. The results from thirty-three drill holes were available for use in computing the gold content in this area, about one-half of the holes being within its limits and the others around it. The average value per cubic yard indicated by these holes was 43.74c., and the dredge recovery was 19.97c., or 45.7 per cent.



GOLD SLUICES IN THE DISCHARGE OF NATOMAS NO. 8

In another part of the same property there has been dredged 118.5 acres, and the results from thirty-eight drill holes were used in making the estimate, fourteen of which holes were outside but adjacent to the area dredged. The estimated value per cubic yard in this tract was 29.88c., and the dredge returns were 31.55c., a gain of 5.6 per cent. I believe the constant used in figuring the drill returns on this property to have been 0.3068.

Another Comparison of Results

Some years ago, on another and undredged portion of this property consisting of 493 acres, an estimate was made to determine the gold content. The results from fifty-three drill holes, which were within the limits of the property, were used by taking 70 per cent of their recorded value. Consideration was then given and use made of the values obtained from dredging operations which had been conducted adjacent to and around two-thirds of the tract. Since then 402 acres of this area have been dredged, the returns per cubic yard averaging 12.73c. The data used in making the original estimate were applied to the portion now dredged, and the proportionate values found to be 12.70c. per cubic yard.

On a small property in California where the gold content was low, it was important to ascertain just what dependence could be placed on drilling results as indicating the probable dredge recovery, and some careful tests were made to determine the extent to which future operations could be extended. A Keystone drill was used, and the calculations were based on a constant of 0.27. Tests were made on three different sections of the property and twenty-seven drill holes put down in 15.3 acres which had an average depth of 30.3 ft. The average value per cubic yard shown by the drilling was 3.04c. and the dredge recovery 8.7c., a gain of 186 per cent. On a tract having an area of ninety-three acres and an average depth of 22 ft., forty-two holes were drilled which indicated an average value per yard of 6.01c. and the returns from dredging were 10.11c., or a gain of 68.2 per cent.

The third tract had an area of 23.5 acres with a depth of 31.5 ft., and the results from twenty-three drill holes gave a value of 4.44c., and the dredge operations yielded 6.40c., or a gain of 44.2 per cent.

Obtaining an average of the results on a basis of the total acreage, the average value per cubic yard of the drill results is determined to be 5.38c. and the dredge returns, 9.28c., an average gain of 72.5 per cent. Had a constant of 0.1565 been used to calculate the drill results, they would have agreed closely with the dredge returns.

Colombian Dredging Results Compared

I have previously referred to the test made by Mr. Prichard on the Pato property, in Colombia, and it will be of interest to know if the deductions which he then made have been substantiated by results obtained from later operations. I have nothing official concerning this, but from some rather meager data I infer that a portion of the dredged area on this property, amounting to about eighty acres and represented by nineteen drill holes put down within and adjoining the area, produced an average value of about 42.5c. per cubic yard, and that the average drill results were about 38c. These figures are approximate, but on such a basis the dredging gain would be about 12 per cent. I also infer that the drill results were obtained by using the liberal factor of 387.

On the Nechi property, across the river from that of the Pato, a dredged area of about sixty acres is considered as being represented by a line of ten holes which were originally put down with an Empire drill through about the center of the area. The average value per cubic yard indicated by these drill holes was about 70.5c., and the average recovery by dredging was about 35.5c. Both of these figures are approximate only, but using them as a basis the dredge returns are only 51.3 per cent of the prospect indications. The values from these drill holes were figured by using a factor of 238, and it is of interest to note that had the factor of 387 been used, which had been proved correct on a certain area across the river, the average drill-hole values would have been increased to 114.6c. and the dredge recovery would have then constituted only approximately 31 per cent of such a value.

With the admission that all of the figures given may be far from correct, I still believe them close enough to demonstrate that a factor proved for use on a limited area having certain conditions may not be correctly applied to another tract in the same vicinity.

Reference having been made to the Chicksan property, in Korea, to the prospecting tests made prior to the installation of a dredge, and to the results obtained from shafts and a pit greatly exceeding the drill values, it should be of interest to ascertain to what extent the results obtained by dredging confirmed the drill prospects, and I here give comparative data based on six-month periods extending from Jan. 1, 1918, to June 30, 1920:

Drill values, cents	14.9	11.35	5.55	7.2	7.7
Dredge recovery, cents	12.25	11.30	9.15	10.0	12.9
Dredge recovery, per cent	82	99.5	165	139	167

The explanation is made that the gold-saving appliances on the dredge did not reach the maximum of efficiency until toward the end of the second period and that the results obtained after that were from normal operating conditions.

I present herewith also the following comparative results produced by operations from three separate tracts in a large California property, the third tract having been mined by three dredges:

Tract	Average Depth, Feet	Acres	Number of Holes	Acreage to Each Hole	Value per Cubic Yard — Drill, Cents	Dredge Recovery, Cents	Per Cent
A	22.5	173.5(a)	57	3.2	6.8	7.82	115
B	44.5	84.0	20	4.2	5.9	6.7	113
C Dredge No. 1	51.8	183.0	120	1.5	11.1	9.64	87
C Dredge No. 2	60.6	106.0	41	2.6	11.2	9.44	84
C Dredge No. 3	56.4	135.0	58	2.3	11.6	11.30	97

(a) Thirty-seven shafts and twenty drill holes.

On Tracts A and B the factor used in calculating drill results was 0.27; on Tract C the factor used was 0.30. The average results of all of the above, proportioned to the acreage, is a drill value of 9.48c. per yard, and the dredge recovery 9.12c., or 96.2 per cent.

An area of 11.76 acres of Alaska Creek gravels was prospected with a 6-in. hand drill, with four holes per acre. These were spaced 50 ft. apart with intervals between drill lines of 300 ft. Schist and limestone bedrock was encountered. The drill values were 95.0c. per yard and the dredge recovery was 96.3c., a gain of 1.4 per cent.

Two California Properties Furnish Additional Examples

A California property is being mined by one dredge, and from a late report I find that the 157 acres now worked were prospected by seventy-six drill holes, an average of one hole to every 2.1 acres. The estimated value was 19.1c. per cubic yard, and the dredge recovery 10.4c., or 54.4 per cent. The report states that in calculating the drilling results on this property the "correction method" was used, and this is described as one "in which the solid material pumped from each foot of drop is measured and the number of colors of gold corrected in the ratio of the actual core extracted to the theoretical volume of core from this foot of drop." The report further states that had the constant of 0.27 been used in making the estimates, the result would have been 16.5c. per cubic yard, and on this basis the dredge recovery would have been 63 per cent of the prospect value.

The manager of a company operating in California gives the following data concerning two separate tracts which have been dredged:

Tract	Average Depth, Feet	Acres	Number of Holes	Acreage to Each Hole	Value per Cubic Yard — Drill, Cents	Dredge Recovery, Cents	Per Cent
No. 1	22.5	559.0	560	1.0	7.58	9.61	126.7
No. 2	35.9	420.5	146	2.9	7.25	8.18	112.9

The constant used in calculations was 0.27. Proportioning these returns to the acreage I find for the property as a whole an average estimated value per cubic yard of 7.44c., and a dredge recovery of 9.0c., being a net gain of 21 per cent.

Dredging operations on one property in California

BUCKETS CUTTING TOP OF BANK. NATOMAS NO. 8.

have produced returns which, taken as a whole, correspond closely with the original estimates, and the following details have been recorded covering the work done in the last three years:

Year	Average Depth, Feet	Acres	Number of Holes	Acreage to Each Hole	Value per Cubic Yard — Drill, Cents	Dredge Recovery, Cents	Per Cent
1918	32.1	19.94	11	1.8	10.39	10.64	102.4
1919	34.4	20.90	10	2.1	9.69	9.22	95.2
1920	29.8	20.43	7	2.9	10.69	14.34	134.0

The average results proportioned to the acreage show an estimated value of 10.25c. and a dredge recovery of 11.39c., or an increase of 11.1 per cent.

From 1908 to 1917 inclusive the area dredged on this property was 229 acres, which was prospected by 173 drill holes, or one to every 1.3 acres. Figures have been given showing the estimated value and dredge recovery per cubic yard for each year, and proportioned to the acreage their average is 10.86c. and 12.34c. respectively, or a dredging gain of 13.6 per cent. There is a wide discrepancy in the comparative results as obtained from year to year during this period, and in 1909 the dredge recovery was only 58.7 per cent of the prospecting value and in the next year the recovery exceeded the prospecting by 94.4 per cent.

The report by Mr. Neill, mentioned above, states that in the thirty-acre tract, which was tested by two independent drillings, there was later dredged seven acres which were represented by fourteen drill holes. The average value indicated by these holes, without making any allowances, was 7.75c. per cubic yard. The dredge recovery was 6.74c., or 87 per cent. If, in figuring the average value of the holes, one-half of the value of the highest three holes had been used, the result

would have been 5.55c. and the dredging gain would have been 17.6 per cent.

The report further states that another piece of ground on the property was drilled with sixty-six holes, which ranged in value from 1c. or less to 66c. per cubic yard. with an average value of 9c. The dredge recovery was 76 per cent.

On a certain Colorado property fourteen holes were put down across a valley with a Keystone drill. These holes were spaced 50 ft. apart, with the exception of the last two, which were 100 ft. apart. Later, a dredge made a single cut, which included ground on each side of this line of holes. The ground had an average depth of 46 ft., and the dredged area, considered as being represented by the drill holes, was 4.5 acres. The value per cubic yard indicated by the drill was 17.19c., and the dredge recovery was 8.79c., or 51.1 per cent. The excavated material was a clean washed sand and gravel with little clay and many boulders, all of a nature which rendered the determination of values by means of a drill exceedingly difficult.

On another Colorado property the operations of one dredge, extending over a period of twelve years, returned 165 per cent of the values indicated by drilling. On the same property a dredge cut through a line of eight drill holes gave an average value per cubic yard of 8.6c. The dredge recovery was 33c., being an increase of 284 per cent. In one year the average value of the 1,300,000 cu.yd. excavated was 25c., which was 290 per cent of the prospect value. The depth of the ground was 38 ft., and it was composed of medium fine gravel with few large boulders.

A part of a Montana property consisting of 300 acres was prospected with seventy-seven drill holes spaced at irregular distances. The average value per cubic yard indicated by the drilling was 15.83c., and the dredge recovery 13.55c., or 85.6 per cent. The average depth of the ground was 40 ft. and the larger portion of the gold content was contained in the three feet of gravel next to the bedrock.

A California property, consisting of 152 acres, was dredged during the earlier period of the industry. Its probable value had been previously determined by means of twenty-three drill holes, one to every 6.6 acres, and found to be 38.6c. per cubic yard. The actual recovery by dredging was 16.3c., or 42.2 per cent. The ground was about 35 ft. in depth and the material consisted of a medium-sized gravel with a large amount of clay, which, when dredged, rendered effective washing impossible. The constant used in calculating the drill results was 0.27.

Shaft Prospecting Vs. Drilling

The question naturally arises as to whether prospecting by means of shafts will give more accurate results than by drilling. The volume of material taken from a shaft is much greater than that from a drill pipe, and the formation is clearly exposed, but where a large flow of water is encountered the gold content cannot be accurately determined.

An area of 39,000 sq.ft. in an Alaska creek was prospected by sinking seventeen shafts, which ranged in depth from six to thirteen feet, and were proportionate to twenty shafts per acre. The gold was concentrated on a calcareous schist bedrock overlain by limestone boulders. The value per cubic yard obtained from the several shafts ranged from a trace to $1.18, with an average of 51.6c. The area was mined by means of a hydraulic elevator and the recovery was 93.5c. per cubic yard, or a gain of 80 per cent.

In a dredging property in Idaho there was one block of forty-four acres which was defined by a line of five shafts at its upper end and by a line with the same number of shafts across its lower end. The shafts were all sunk in ground containing but little water. It was 1,500 ft. between the two lines, and the shafts were spaced about 320 ft. apart. By using the results obtained from these shafts, the average value per cubic yard for the whole block was estimated to be 9.9c. The dredging returns were exactly the same.

One California property, containing 140 acres, was prospected by sinking fifty-one shafts, which returned an average value of 15c. per cubic yard. The dredge recovery was 15.9c., a gain of 6 per cent.

The estimated gold content in a property consisting of forty acres was determined by drilling a few holes and sinking a greater number of shafts, twenty-two tests in all. This work gave expectations of recovering 29c. per cubic yard, and the dredge returns were 18.2c., or 62.8 per cent. The formation contained considerable clay.

Reviewing the drilling returns in an attempt to make such deductions as may have possible value, one is confined to the acreage as a basis of comparison, as gross yardage and returns have not been reported.

From all of the properties above mentioned it is possible to segregate 3,743 acres, to which data given in fairly accurate reports can be applied. This combined area was prospected by means of 1,749 drill holes, or one to every 2.1 acres. The average value per cubic yard obtained by drilling was 15.4c., and the average dredge recovery 13.55c., or 88 per cent.

A comparison of returns, segregated as to values, is as follows:

Drill Values per Cubic Yard	Acres	Per Cent of Total Acreage	Average Value per Cubic Yard — Drill Value, Cents	Dredge Recovery, Cents	Per Cent Gain	Per Cent Loss
Under 11c.	27.9	0.7	9.21	8.60	....	6.6
Under 11c.	1,638.1	43.8	7.68	9.34	21.6	....
Between 11 and 12c.	424.0	11.3	11.28	10.12	....	10.3
Between 11 and 12c.	480.0	12.8	11.61	16.44	41.6	....
Between 12 and 20c.	582.5	15.6	16.92	13.10	....	22.6
Over 20c.	392.0	10.5	45.86	20.93	....	54.4
Over 20c.	198.5	5.3	33.15	35.97	8.5	....
Totals	3,743.0	100.0	.....	.....	....	....
Averages	.....	.....	15.40c	13.55c	....	12.0

Of the whole area 38.1 per cent shows an average drill value of 23.05c. and a dredge recovery of 14.28c., a loss of 38.0 per cent; 61.9 per cent of the whole area shows an average drill value of 10.68c. and a dredge recovery of 13.10c., a gain of 22.7 per cent.

The constant 0.27 was used in calculating the drill results from 44.3 per cent of the combined area and in which the indicated values were all less than 11c. per cubic yard. The dredge recovery from this portion of the area shows a gain of 21.1 per cent.

I feel that a safe conclusion to be drawn from all of the above is that when a property had been sufficiently prospected by an experienced engineer, the results intelligently interpreted, and the calculations accurately made, the result obtained will indicate within reasonable limits the gold content. Full consideration should be given all of these points, and then if the estimated gross value safely and sufficiently exceeds the cost of acquisition, equipment, and operation, there should be nothing to deter or discourage the investment of capital in such an enterprise.

Some Interesting Relations Between Vegetation And Mineral Deposits

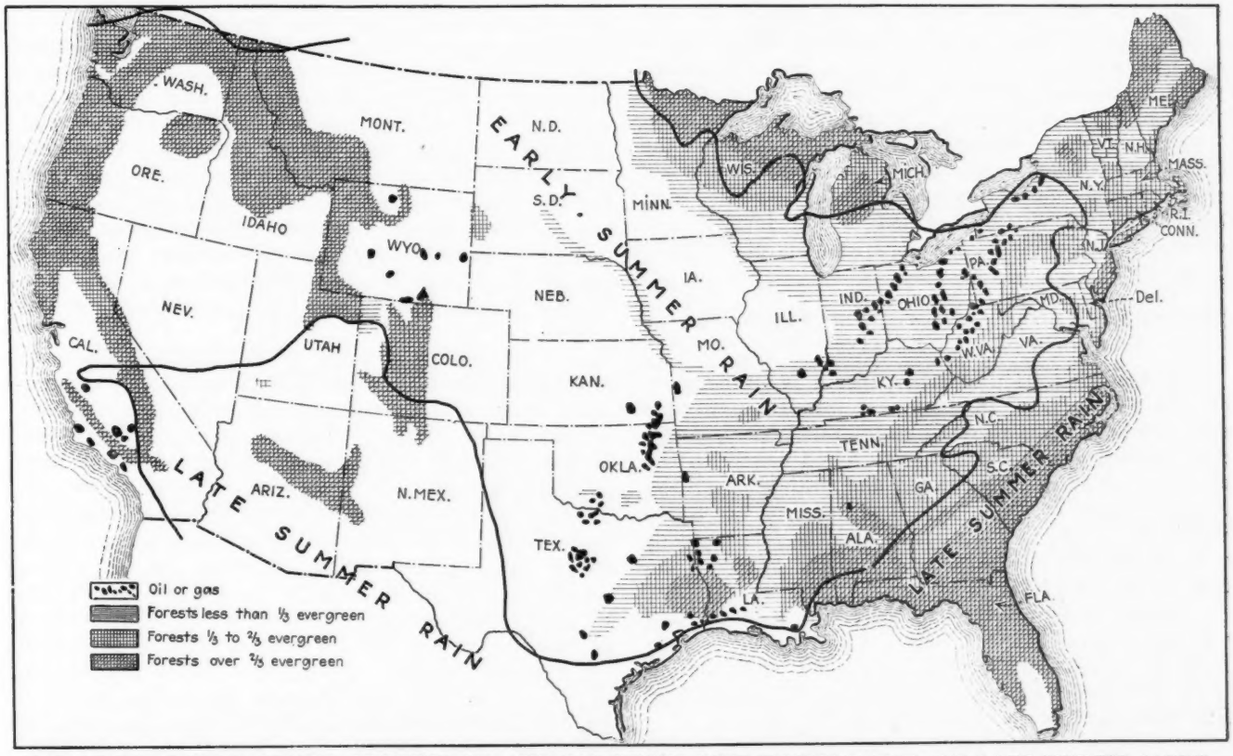
Rainfall, Forestation, and Occurrences of Minerals, Particularly of Oil, Appear To Be Coincident, Possibly Due to a Similarity in the Conditions Which Account for Their Existence Together—Oil Wells Generally Occur in Regions Favorable to the Growth of Deciduous Trees

BY ROLAND M. HARPER
Geographer, Geological Survey of Alabama
Written for *Engineering and Mining Journal*

THE COMMUNICATIONS on the relation between vegetation and mineral deposits in recent numbers of *Engineering and Mining Journal*, by F. M. Wichman (Dec. 20, 1920), Gordon Surr (Jan. 15, 1921), and Edgar T. Wherry (June 4, 1921), suggest additional observations which may be of interest to many readers. It was observed long ago, particularly in Europe, that certain species of plants are chiefly confined to a specific variety of soil or rock, and sporadic attempts have been made to use such plants as indicators of the presence of useful minerals. Dr. R. W. Raymond, in a short paper entitled "Indicative Plants," in the 15th volume of the *Transactions* of the American Institute of Mining Engineers (1887), summed up previous observations and added a few of his own. Ten years later Sydney B. J. Skertchly, in a Queensland Geological Survey report on the tin mines of Watsonville, included a short chapter on the "copper plant" (*Polycarpæa spirostyles*), which he found abundant in the vicinity of copper lodes in northern Queensland, and determined by careful analyses to contain distinct traces of copper in its ash. He also mentioned a few other instances of supposed mineral-indicating plants in the same country, and referred to Dr. Raymond's observations in the United States.

A great difficulty about correlating plants with soils or minerals is that few species of plants are confined to just one type of soil. It has happened repeatedly that a botanist has formulated a beautiful hypothesis about such a correlation in a small area, and afterward visited a different region, only to find apparently the same species growing on quite a different soil, thus upsetting his hypothesis. But instead of focusing attention on one species at a time, and determining its mere presence or absence, it is possible to study vegetation quantitatively and get much more satisfactory results.

For example, two different mountains, islands, or other similar areas might have exactly the same species of trees on them, but in very different proportions,



MAP OF THE UNITED STATES, SHOWING OIL AND GAS FIELDS, LINE WHERE EARLY AND LATE SUMMER (APRIL-JUNE AND AUGUST-OCTOBER) PRECIPITATIONS ARE EQUAL, AND FORESTS IN THREE DEGREES OF EVERGREENNESS. NOTE THAT THE OIL FIELDS ARE NEARLY ALL IN THE EARLY-SUMMER-RAIN AREA, AND WHERE THE FORESTS ARE MAINLY DECIDUOUS OR ABSENT

indicating different soil conditions. If one had nine-tenths of its trees pines or other evergreens and the other one nine-tenths oaks and hickories, one would naturally expect to find the latter having the richer soil; for trees growing in poor soil cannot as a rule extract nutriment from it fast enough to make a complete new crop of leaves every year, but must keep each leaf two or more years. Or, to put it in another way, trees growing in rich soils take up mineral matter so fast that they have to shed their leaves at frequent intervals, for that is almost the only way they have of getting rid of it. This sort of correlation has been made innumerable times by farmers in clearing new land for agricultural purposes, the hardwood land being cleared first and the forests of pine, spruce, and other similar woods avoided.[1]

In *Science* for Aug. 30, 1918, I pointed out that if for every weather station in the United States, or for as many of them as practicable, the difference between the rainfall for April to June inclusive and that for August to October be determined, and the results plotted on a map, some interesting correlations with soil and other factors can be made. The area of early summer excess, which includes practically the whole drainage basin of the Mississippi River and a few smaller rivers on either side of it, is characterized by silt loams and other fertile soils, with deciduous forests or prairies, whereas the late-summer-rain area, along the northern, eastern and southern edges of the country, has much more sand, peat, and evergreen trees. Furthermore, tornadoes, muddy streams, and river floods are chiefly confined to the former, and hurricanes, clear rivers, swamps, and sheet-floods to the latter.

Rainfall, Mineral Deposits, and Forestation Seemingly Related

Since the publication of that paper a few other contrasting features of the parts of the country thus separated have come to mind. Mineral springs, petroleum, natural gas, and lignite are found mostly in the early-summer-rain or hardwood and prairie area, and gold and copper in the other. Coal and iron are somewhat intermediate in distribution, but the former tends more toward the hardwood area and the latter to the pine, in the United States at least.

Although these correlations may not hold so well in other continents, and it may not be possible to offer a logical explanation for them at present, it is reasonable to use them as working hypotheses in prospecting, until they are shown to be wholly accidental.

The relation of vegetation to petroleum distribution is especially interesting. At least nine-tenths of the productive oil wells in the United States at this writing are in regions where, if any trees at all exist, they are mostly deciduous; and even if a few wells should be "brought in" in pine regions, this general statement seems likely to hold true for some time.[2] (The correlation is especially striking in West Virginia, where the oil wells are in the northwestern half of the state and the coniferous forests in the southeastern, and in western Louisiana and eastern Texas, where several thousand square miles of long-leaf pine country occur with oil wells all around, but none in the area, as far I have been able to ascertain.) Natural gas extends a little farther into the pine regions than petroleum does, having been obtained near Fayette and Mobile, Ala., for example. Similar relations may obtain in other countries, for, as has been pointed out by Maurice G. Mehl,[3] nearly all the important oil fields of the world are between 20 deg. and 50 deg. north latitude, and between the isotherms of 40 deg. and 70 deg. Fahrenheit. And although Mehl does not allude to the fact, that is just where the largest areas of fertile soil and the great deciduous forests are located (or were located a few centuries ago, before the forests were mostly destroyed to make room for farms). Both boreal and tropical forests, as is well known, consist mainly of evergreens, and comparatively little of the land they occupy has been found worth clearing at any one time for agricultural purposes.[4]

Relationship May Be Explained by Similarity in Conditions Originating Deposits and Forestation

The accompanying map of the United States shows, about as accurately as is possible with so small a scale, the oil and gas fields, the line of equilibrium between early and late summer rain, and the proportion of evergreens in the forests in three grades, namely less than a third, one-third to two-thirds, and over two-thirds. The oil fields are delineated from a large map published by the U. S. Geological Survey in 1917, supplemented by later information for a few areas, and the climate line is based on my computations made for the article in *Science* previously mentioned, but has not been published before. The mapping of the forests is based on personal observations in most of the states, supplemented by examination of easily accessible literature which need not be specifically referred to here.

As I am not a geologist, I do not feel competent to explain the correlation between petroleum accumulations and rich soils characterized by hardwood forests or prairies, but probably the most plausible suggestion is that the same conditions of deposition which have favored the production of oil have produced limestones and shales that weather into fertile soils. Of course the strata at the surface may be quite different from those several hundred feet below in which the oil occurs, but the latter usually come to the surface somewhere not many miles away. An important relation between oil possibilities and the percentage of fixed carbon in coal has been pointed out by David White[5] and others, and it may be that the pressure which has increased the fixed carbon has also hardened the rocks over the coal so that they weather more slowly and make shallower soils than they would otherwise.

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[1] See 6th Ann. Rep. Fla. Geol. Surv. (1914), pp. 175-177, 396.

[2] See 13th Ann. Rep. Fla. Geol. Surv. (1912), p. 160, first footnote.

[3] "Some Factors in the Geographic Distribution of Petroleum"; Bull. Sci. Lab. Denison Univ., Vol. 19, pp. 55-63, pl. 12, 13; 1919. See also the article on "Petroliferous Provinces," by E. G. Woodruff, in Bull. Am. Inst. Min. & Met. Eng., No. 150, pp. 907-912 (June, 1919), reprinted in the *Petroleum Times* (London), Jan. 17, 1920, and discussion thereof by Charles Schuchert in same, No. 155, pp. 3,058-3,070 (November, 1919), and by Mehl in *Science* for May 28, 1920.

[4] A common agricultural practice in the tropics of both hemispheres is said to be clearing a piece of land and cultivating it a few years, and then abandoning it and clearing another, which would hardly be necessary if the soils were as permanently fertile as those of our Mississippi Valley. For a good account of this practice see C. H. Stigand, "The Lost Forests of Africa," in the *Geographical Journal* (London), Vol. 45, pp. 513-520, 1915.

[5] Jour. Wash. Acad. Sci., Vol. 5, pp. 189-212; 1915. Bull. Geol. Soc. Am., Vol. 28, pp. 732-734; 1917. See also M. L. Fuller, Bull. Geol. Soc. Am., Vol. 28, pp. 619, 643, 649-650; 1917. *Economic Geology*, Vol. 14, pp. 536-542, November, 1919; Vol. 15, pp. 225-235, May, 1920; S. J. Lloyd, *Economic Geology*, Vol. 15, pp. 94-96, March, 1920. D. R. Semmes, *Mining and Metallurgy* (Section 5, separately paged), March, 1920; Geol. Surv. Ala., Bull. 22, pp. 54-56, July, 1920.

Smelting Sulphur and Arsenic Ores in China

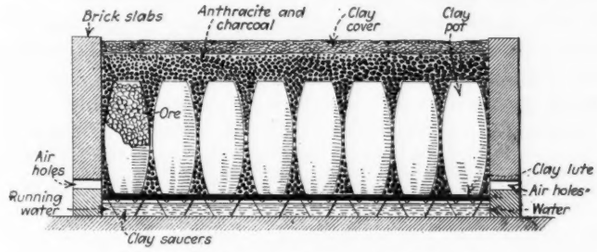
Primitive Methods, Hundreds of Years Old, Still Obtain —Intermittent Processes Using Clay Pots And Retorts Employed

BY ROBERT SLESSOR
Written for *Engineering and Mining Journal*

CAKES OF SULPHUR and of arsenic oxide are made in southern Hunan from iron pyrite and arsenopyrite. Like all Chinese metallurgical work, the method is simple, cheap, and inefficient.

The iron pyrite used for sulphur making contains about 35 to 40 per cent of sulphur, but, according to locality, it carries more or less arsenic, lead, and zinc. There is little gangue, usually siliceous, with a small amount of lime. The ore is broken to 1-in. size, a few 4-in. lumps being present, however, as well as the fines. The smelting operation is conducted in a clay retort resting on a clay saucer, which receives the melted sulphur.

The retort is of baked clay, circular in section, about 18 in. high, with diameter of 6 in. at each end and 7 in. at the center. One end is open. The saucer is 8 in. diameter at top and 6 in. at bottom, by about 5 in. high. The retort is filled with the broken ore, the 4-in. lumps being placed along the center line, with the fine ore around, and the 1-in. ore carefully filled in, so as to leave interstices. The retort is filled to within 1 in. from the top, and a ring of dried grass is inserted. The top is covered with 2 in. of soft clay, thinned to about ¼ in. at the center. It is then reversed, mouth down, on to the saucer, on which it rests supported by two



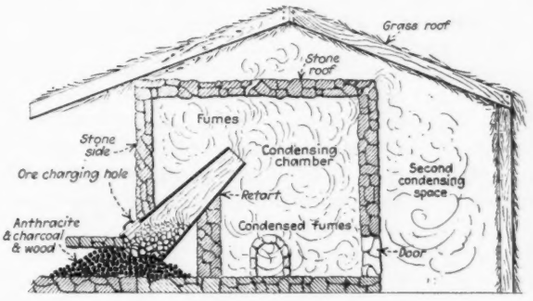
SECTION OF SULPHUR FURNACE

strips of bamboo. The 1-in. space around the lip of the saucer and the mouth of the retort is luted with a ring of about 1½ in. of soft clay. Eighty of such pots and saucers are arranged in a rectangle. The pots are so placed that the clay rings round the saucers touch each other. A piece of broken earthen pot is placed between the space formed by each four pots, to prevent the fuel from falling down. The four sides of the "furnace" are formed of clay slabs luted together, to about 30 in. in height. Along each long side are a series of air holes, above the level of the saucers.

Glowing coals are then packed in the interstices between the pots and charcoal, and coal is added gradually until the whole space between the pots is filled with fuel, level with the top. A layer of old burnt clay lumps is then added, and the whole covered with soft clay.

The air is regulated by the air holes along each side, and by making holes in the clay cover. The whole art of the process is to regulate the heat so as not to sinter the ore into one mass. When the fire begins to take hold, the ore can be heard decrepitating in the pots, and if the explosions are violent, a few filled pots are placed on top to keep the retorts down in place. Water is run around the saucers to a depth of about 3½ in., and as the water is running the melted sulphur cools in the saucers. The thinned center of the lute in the retorts allows the melted sulphur to break through.

The whole operation from lighting to taking out the sulphur cakes lasts from eighteen to twenty hours. Usually, at least two furnaces are in a shed, and while one is being prepared the other is being fired. After each melt, the whole is dismantled and rebuilt. The cinders from the operation are in nowise "purple ore," as the burning extracts only about half or less of the



ARSENIC FURNACE

sulphur. Each retort takes about 50 lb. of ore and yields about 5 lb. of sulphur. The sulphur is about 97@98 per cent pure, and is exported for making firecrackers, blasting powder, and medicine. Two furnaces of eighty pots will make about three tons of sulphur from thirty tons of ore. The operation requires the labor of five men about twelve hours daily, and the cost of sulphur is about 3 to 4 Mexican dollars per picul at the plant. Anthracite coal is used, which costs about 7 Mexican dollars per long ton.

THE EXTRACTION OF ARSENIC

Arsenic is extracted from an ore containing about 15 per cent arsenic as arsenopyrite, with a little lead, zinc, and silica, the rest being iron and sulphur. The ore is broken to 5-in. size and roasted in a furnace built of granite boulders or any other rock that is handy.

The furnace consists of a retort and condensing chamber. The base of the retort serves as a hearth, on which is piled the fuel of green wood, charcoal, and anthracite. The draft is regulated by poking holes in the pile of fuel. The retort is inclined and made of burnt clay. A feed hole allows the ore to be placed in front of the fuel, and is covered with a clay slab, that is luted down when the charge is put in. The heat is regulated to cause a gentle roast at first, and is gradually raised, after most of the sulphur fumes are driven off.

The arsenic fumes condense as a brown yellow powder and are drawn from the bottom through an opening in the wall. Much fume escapes through the roof and sides, as the clay mortar is only roughly put in. Some of this fume is caught in the thatch of the shed at the back, which acts as a second condensing chamber. The grass of the thatch is purposely loosely fastened, and after a charge, it is gently beaten to cause the fumes to fall. Each "furnace" consists of four retorts and four condensing chambers, separated by stone partitions. Usually two retorts are being fired while two others are being charged and repaired. Where long

rock slabs are not to be had, the roof is often roughly domed like a beehive.

A four-retort furnace takes about one month to build, costs about 25 Mexican dollars, and lasts indefinitely except for repairs to the retort and walls each time the furnace is cleaned. The furnaces last longer than the mines, as many old furnaces, going back to the Ming dynasty (1,500 A.D.) can be seen scattered over the country.

A furnace is about 25 x 8 x 6 ft. high and can produce about three tons of 60 per cent fume monthly, working twelve hours daily. The fume so produced is impure and must be refined in a near-by village. It is slowly roasted several times, and run into cakes of "white arsenic." The No. 1 quality is rose white, and the No. 2 quality is pink red.

Arsenic has always been in great demand in China for the tombs of the richer class. The more arsenic that can be packed into a tomb around the wooden coffin, the more perfectly preserved will be the body. The Chinese belief is that any bodily defects will be transmitted to the body which they will wear in after life.

Most of the lead, zinc, and tungsten mines of southern Hunan were formerly old arsenic mines that have been reopened. Many of these old arsenic mines were worked 500 or more years ago, with apparently the same methods, using steel and blasting powder, as boulders can be seen that were evidently drilled and blasted. These mines were abandoned as the arsenic tenor grew lower. Much of the tungsten exported to America during the war came from the old dumps of these arsenic mines. Once recognized, the tungsten ore was easily hand-picked from the dumps.

Russian Metallurgical Industries

The *Quarterly Journal* of the Russian Economic Association contains several papers dealing with the present condition of the metallurgical industries in Russia which are reviewed in the *Journal* of the Society of Chemical Industry for July 30, 1921. The largest pre-war copper production was at the Kishtim works, in the Urals, where in 1914 more than 32,258 long tons (2,000,000 poods) of copper was produced. This fell off by about 20 per cent during the first years of the war, and has now practically ceased, only a few small works being still in operation.

Although deposits of zinc ore are found all over Russia, the production of zinc metal in 1914 did not exceed 1,129 tons, but works with a productive capacity of 48,387 tons per annum were begun in 1915, and, although not finished, produced 29,032 tons of metallic zinc by the end of 1917. The revolution has arrested the completion of the works, but it is believed that, could they be started again, not only the home market but also foreign demand might be satisfied, especially as many of the Siberian zinc-ore deposits contain sufficient silver and gold to reduce the cost of production below that of the United States or Germany.

Lead-ore mining was begun in Russia in 1704, and during the eighteenth century production steadily increased; it began to decline during the nineteenth century owing to the difficulties encountered in working the complex ores found in Siberia. In 1916, however, works for the production of more than 16,000 tons annually were erected at the Ekibastus mines, and mines were started in the Kirgis steppes, the Caucasus and the Urals. The completion of the South Siberian railway should open up a country rich in lead ores and with good coal deposits, of which those at Ekibastus and Kuz-Chikinsk are already worked. The Russo-Asiatic Consolidated Co., Ltd., on completion of its projects, should be able to produce annually metals and minerals (including coal) to the value of over £40,000,000.

In 1913 Russia produced about 56 per cent of the total world's output of manganese but only 5 per cent of its pig iron. The large surplus of manganese ore supplied 65 per cent of the total German requirements, and as Germany will have to rely almost entirely on Russian supplies, the future of the industry seems assured. The fuel crisis is the real cause of the delay in reconstruction.

Decreased Silver Exports From Chihuahua To the United States

More silver was produced in the Chihuahua consular district (which includes such important silver camps as Parral, Santa Barbara, Santa Eulalia, and Cusihuiriachic) during 1920 than in any year since 1910, according to Consul James B. Stewart in *Commerce Reports*. In fact, judging from the available figures, 1920 was one of Chihuahua's banner years, comparing favorably with the best years previous to 1910 and no doubt exceeding most of them in the total amount of silver produced.

The increased silver production in Chihuahua is not due to the operating of a larger number of mines (fewer are being operated than in former years), but to the ability of large mining companies, mostly American, to work the large low-grade properties, this having been made possible by the installation of modern machinery and new processes of ore handling and treatment. Especially has this been the case in the Parral district, which is one of the world's leading low-grade silver camps.

The following table shows the silver bullion and ore declared at the Chihuahua consulate for export to the United States during the entire year of 1920 and the first six months of 1921:

Items	—Calendar Year 1920—		First Six Months, 1921	
Bullion	Troy Ounces	Value	Troy Ounces	Value
Gold-silver-lead	4,968,570	$4,888,354	3,121,189	$1,866,365
Silver	3,717,747	2,411,250	1,870,786	1,111,304
Raw matte	287,472	241,797	29,854	17,533
Silver ore	187,615	231,621	.....	.....
Total	9,161,404	$7,773,022	5,021,829	$2,995,202

As the entire silver production of this district is exported to the United States, the preceding table gives a fair idea of the silver produced in the district. These figures, however, must not be taken as showing that the Chihuahua mines are now producing more silver than last year, because for several months the lead smelter at Chihuahua, which produces the gold-silver-lead bullion, has been the only large one of its kind operating in Mexico, and so it has been receiving and smelting rich silver ores and concentrates from various parts of the republic, even from mines in the vicinity of Mexico City. Whereas the ores usually smelted at Chihuahua average around 6 kilos of silver per ton, the high-grade ores being received from the south average as much as 12 and 13 kilos and even more.

BY THE WAY

From a Wandering Subscriber

In one of the South American ports where considerable ore buying is done by several American smelting companies, the agents of two of these companies live respectively next door to and across the street from a respectable native metal engraver, who displays prominently the usual engraver's sign in Spanish, *"Grabador de Metales."* One of the many wandering gringo mining engineers, whose first article of faith is that smelting companies are the world's champion robbers, drifted down the street. He stopped before the engraver's sign, contemplated the other signs in the immediate neighborhood and soliloquized aloud:

"Metal grabber, eh! Well, all the ore thieves in this burg seem to live in the same street, but you're the only one with decency enough to say it."

Capacity Wanted

"These days, m'son," said Cap'n Dick, "h'everything is for h'increased capacity. Moore tons per man, larger skips, larger cars, an' so it gaws till h'it seems as though, h'outside o' tha timberin' an' single- an' double-jackin' that we did in the h'early days, we wuz 'ardly minin' h'at all. But, jus' tha same, m'son, t'wuzn't h'as though we didn't 'ave some h'ideas h'as to makin' tha mos' o' wot we 'ad. I remember one time, years h'ago in Grass Valley, Jimmy Trebilcock went to tha livery stable an' sez, 'Gim-me tha bes' ole 'orse thee's got in tha stable. I'm goin' to a gert dance tonight.' 'Thee doesn't want a 'orse, thee wants a 'orse an' buggy,' sez tha h'owner. 'Gos' along do,' sez Jimmy, 'Don't thee tell me w'ot I want. I wants a 'orse with a bloody long back, you—there's five o' us goin'.' "

Alice Does a Little Kicking

"You may be glad to assist [writes Alice to the editor] with advice, if not with situations, the many jobless chemists who are roaming up and down the columns of the technical papers. Thomas Drier, in *Forbes Magazine,* points out the way to a no cost of living, as follows:

"The chemist has a laboratory stocked with the seventy-eight elementary chemicals. With that stock he can make absolutely every substance needed in his daily life, if he possesses the necessary knowledge properly to combine the elements."

"The necessary knowledge? Bah! A mere trifle! But the stock-rooms of wild laboratories we have known never contain 'the seventy-eight (?) elementary chemicals.' "

Personals

George Johnson, florist and prospector, has returned to his work in Sacramento, Cal., after spending the summer working his claims at Yankee Jims in Placer County.

Elmer A. Wolf and R. A. George have bought the Hill claim next to the Sporting Boy mine in El Dorado County, Cal. They also plan to plant a considerable acreage of grapes.

Luther Burbank will use radium ore in experiments to develop new plants, according to Henry A. Adrian, associate of Burbank.

L. Maquenne and E. Demoussy have published data showing the antagonistic effects of copper and injurious effects of iron on plant roots, which suggest several practical applications.

Lewis Carroll in Wall Street

"It is generally accepted," writes Harry J. Wolf, "that clever promoters regard professional men as 'easy marks.' Engineers are supposed to have an analytical turn of mind, and should therefore be exceptions, but apparently the sharks who try to slip you the red-hot tips do not think so. In any event, I received no less than ten bucket-shop 'market letters' the other day, all within eight hours. On reading their leading recommendations, any mining engineer who has lived in a wide-open mining camp could see a chance to make money by 'coppering' the bets suggested.

"The same evening, while I pondered over the multiplicity of opportunities that had been offered me to play the game of 'Heads you win and tails I lose' by anteing an 'initial payment' or a volatile 'margin,' a certain small boy demanded that the evening story should be a selection from 'Through the Looking Glass,' and it so happened that our progress through this dreamy work included that grotesque little versification called 'Jabberwocky.'

"Later the same evening, a particularly vicious cigar which a friend had given me to smoke after dinner caused a confused short-circuiting and crossing of mental wires, so that bucket shops and jabberwocks got all mixed up, and the following parody was evolved from the cerebral confusion. I send it to you with the thought that if some susceptible young engineer should be so unfortunate as to read a 'market letter' in an unguarded moment, he might counteract the infection by administering at once a full shot of this ripsometer":

BUCKETSHOPPY

By HARRY J. WOLF

With apologies to Lewis Carroll

'Twas bullish, and the guileless lambs
In slaughter pens did congregate;
All hypnotized by board-room shams,
They rushed by hundreds to their fate.

Beware the bucket shop, my son!
The bulls that gore, the bears that scratch;
Beware the payment plan, and shun
The dope that suckers snatch.

The victim comes, bank roll in hand,
And eager ear for red-hot tips.
For trustful rube the game is planned,
And headlong in the trap he slips.

Then as his margin fades away,
And he is breaking through thin ice,
He cries for succor in dismay,
While bear cubs trim him in a trice.

Short sales he tries when stocks should slump,
The spurious broker guides his thought;
But little bulls stampede, and bump
His profits t'other side of naught.

He listens to the house man's pull
For payment plan on stocks preferred,
But when the bucket gets too full,
His wad is with the wreck interred.

'Twas bearish, and the guileless lambs
In slaughter pens did congregate;
All hypnotized by board-room shams,
They rushed by hundreds to their fate.

CONSULTATION

Assessment Work Must Be Performed

"You have been giving some space to the question of annual assessment on unpatented mining claims. I would like to submit for your opinion a rather common situation. For instance, work is under way but not completed on the last day of the year the assessment work is intended to cover; the work is continued into the following year. When enough has been done to cover the requirements of one year, the owner records his 'Proof of Labor' for the year in which the work ended, leaving the previous year without any recorded evidence of work being done. Where no contest exists is his title jeopardized?

"Another case somewhat less common I believe is this: Because of extra good facilities and efficient work a tunnel is driven or a shaft is sunk a distance that under ordinary circumstances would cost a total equal to the assessment required, but is done at a less expenditure. The owner in his 'Proof of Labor' specifies the footage done instead of the expenditure made. Would a contestant in the face of the filing have to show the work as insufficient to be successful?"

In Bulletin 94 of the U. S. Bureau of Mines, "U. S. Mining Statutes Annotated," by J. W. Thompson, the following annotation is made:

"It is fraud against the Government and the law to hold quartz claims by merely doing a few dollars' worth of work thereon at or near the beginning of the year next following the year on which the claimant failed to do the necessary work, when such work is not commenced with the bona fide intention of being continued until the full amount is done."

Locators are required by law to perform $100 worth of assessment work annually on each claim they hold except when a common improvement benefits all the claims, in which event the aggregate assessment work can be performed on one claim. During the war Congress relieved locators from performing this work. If assessment work is not executed according to the provisions of the mining law, the claim becomes subject to relocation. Another annotation in the same bulletin states: "The requirement that a certain amount of labor each year be done on a mining claim is imperative, and failure to do so renders the claim subject to relocation."

A miner can hardly be said to have title to his claim when it is unpatented. A better expression is possessory right. He does not obtain title from the Government until the land is patented. His possessory right is threatened by a failure to perform the required assessment in the stipulated period. If the locator fails to complete his $100 worth of work on his claim and desires to retain possession of it he should immediately relocate and faithfully perform the work required under the law.

In the example cited by our inquirer the possessory right to the claim would be jeopardized on two grounds: (1) The $100 assessment work was not completed in the first year; (2) a similar amount of work was not done in the second year. In answer to the second paragraph of the inquiry, there is no set standard in mining law by which the value of assessment work can be judged. The value is expressed in dollars, and should the locator be so fortunate as to be able to show a greater amount of development work than an equivalent expenditure would produce on another claim, he should continue his work until the entire $100 has been expended.

No Market for Wollastonite

"Can you give me the following information with reference to the mineral known as wollastonite:

"1. What use is made of this mineral?
"2. Has it a commercial value?
"3. Is there a market for this mineral?

"For your information, will state that there is a large deposit of this mineral in this section, which, according to test, runs about 98 per cent pure and of which there is apparently an unlimited supply.

"If you know of any concern, company, or individual through whom a market for this mineral could be secured, I shall appreciate it as a personal favor if you will give me the address of such company, concern, or individual. Shall be glad to send you a sample of this mineral if you care to have me do so."

The mineral wollastonite belongs to the pyroxene group of rock-forming minerals and is a silicate of calcium. So far as *Engineering and Mining Journal* is aware, it has no commercial application. It is difficult to see from its composition exactly how this mineral could be used. Containing both lime and silica, it cannot even be employed efficiently as a flux. It might be well to communicate with the U. S. Geological Survey, or the U. S. Bureau of Mines, Washington, D. C., to ascertain whether either of these two organizations has heard of any commercial application of wollastonite.

Consumption of Monazite

"Can you tell me what the consumption per annum in the United States is of a monazite that contains 8 per cent of thorium oxide? Where can I sell it? Who are the people likely to want to buy the mine?"

The production of monazite sand in the United States is small, and probably does not amount to more than $5,000 in value per annum. No definite production figures are given by the U. S. Geological Survey for 1919 or 1920, but in 1915, 1916, and 1917 production averaged about $2,900. This gives some idea of the smallness of the industry. Even considering imports of monazite, which reached their peak value of $355,017 in 1917, the magnitude of monazite production and utilization is found to be low.

A monazite sand containing 8 per cent of thorium oxide is a rich grade of mineral and much higher than the average of the monazite produced for commercial purposes in the United States. Monazite may be sold to mineral dealers, chemical manufacturers, light manufacturers, and incandescent gas and electric light manufacturers. A list of possible consumers will be mailed to subscribers upon request. The same companies or individuals offer the best market for the disposal of a mine.

In the Oct. 22, 1921, issue of *Engineering and Mining Journal*, under Consultation, was given some further general information regarding monazite and its uses.

HANDY KNOWLEDGE

A Method for Rapid Removal of Powder Smoke in Tunnels

BY WALTER S. WEEKS AND GEORGE L. WOLFLIN
Written for *Engineering and Mining Journal*

One of the principal factors which control the speed and economy of tunnel driving is the ventilation system. This must provide for the rapid removal of powder smoke after blasting and supply a sufficient quantity of fresh air for the men at the breast. The object of this paper is to describe experiments made to improve methods of tunnel ventilation. These entailed many measurements of the velocity of air flowing in pipes, so a method for quickly determining that velocity was first developed.

The simplest instrument for measuring air velocity is the anemometer. The velocity of air flowing in a pipe is greatest near the middle and least near the sides. There is no way of determining the mean velocity

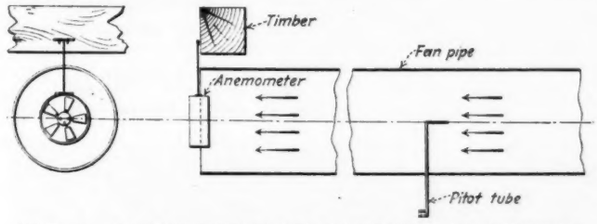


FIG. 1. ARRANGEMENT OF APPARATUS FOR DETERMINING VELOCITY OF AIR

directly with an anemometer. The anemometer is so large with relation to the pipe that traversing the pipe gives incorrect results. The method used in the experimentation here described was to hang the anemometer in the center of the pipe and with the anemometer running, to make two traverses of the pipe at right angles to each other with the Pitot tube. The arrangement of the apparatus is shown in Fig. 1.

METHOD OF MAKING TEST

Almost all anemometers are tapped with a screw thread at the base. A brass rod with a crosspiece at the top should be fitted into this, so that the anemometer can be held in the center of the pipe without the hand interfering with the air current. A stop-watch was started at the beginning of a test and stopped with the anemometer. The velocity was calculated from the anemometer reading, and this velocity was corrected by the maker's correction.

The average velocity in the pipe was calculated from the Pitot tube readings. The true average velocity determined by the Pitot tube, divided by the corrected reading of the anemometer, gives a factor by which the velocity determined by the anemometer must be multiplied to give the average velocity in the pipe. All of the work was done on 12-in. pipe, so the factors that are here given are applicable only to this size of pipe. Factors for other sizes may be determined by the same method.

We calibrated different sizes and types of anemometers, but for the ventilation experiments used a high-speed instrument with a range up to 6,000 ft. per minute. An anemometer should not be used for a velocity above the maker's rating. They are absolutely unreliable if so employed. The ordinary anemometer for measuring velocity in a drift is seldom rated above 2,000 ft. per minute. Velocities in pipes are usually much greater, so a high-speed anemometer should be used.

The first tests were made with the fan blowing. The average velocity was varied from 900 ft. to 2,100 ft. per minute. A 6-in. Keuffel & Esser anemometer, rated at 6,000 ft. per minute, gave readings which produced an average factor of 0.85. This means that if those making the test hold the anemometer in the center of the pipe as shown in the sketch, and determine the velocity in feet per minute, and apply the maker's correction for that velocity, this value multiplied by 0.85 will give the average velocity in a 12-in. fan pipe.

As the air flows fastest in the center of the pipe, it would be supposed that a smaller anemometer would give higher readings, because the average velocity of the air which strikes the blades would be greater. This did not prove to be the fact. The smaller instrument gave lower readings and demanded a slightly higher correction factor, usually about 0.88. The interference of the air current by the dial probably made eddies which caused this result. If the factor 0.85 is applied to the reading of any anemometer used under these conditions and within the rated speed of the instrument, a close approximation of the average velocity will be obtained.

Next a set of readings was taken with the fan exhausting. With the same average velocity in the pipe, the anemometer gives higher readings when the fan is exhausting than when blowing. This is because the column of air contracts when it enters the pipe so that the air that passes through the blades is going faster than it would if the air entered the pipe parallel to it. We found the factor to be 0.70 when the fan was exhausting.

That there may be no doubt as to the use of these factors let us correct two readings.

1. Fan blowing. Anemometer reading, 2,530. Maker's correction —50. Average velocity = $0.85 \times 2{,}480 = 2{,}108$.
2. Fan exhausting. Anemometer reading, 2,221. Maker's correction —34. Average velocity = $0.70 \times 2{,}187 = 1{,}531$.

Turning to the ventilation system. In preliminary tests we determined the following facts:

1. To remove smoke quickly from the breast the air must be delivered at the toe of the muck pile so that it sweeps up the muck pile and moves the smoke out along the back.

2. There is a critical velocity of air in a tunnel, below which the smoke is merely stirred up and diluted. If this velocity is exceeded the smoke moves out as a body.

The system that we devised may be best explained by referring to Fig. 2. *A* is the main fan outside, equipped with a four-gate system so that the fan may exhaust or blow. The main air pipe *B* is carried in along the back to within 100 ft. of the breast. *C* is a low pressure auxiliary fan direct-connected to a motor. It is

mounted on handle bars as shown in Fig. 3. To the small fan is connected enough 12-in. Flexoid tubing to reach to the toe of the muck pile. *D* is a canvas closing the tunnel to within 2 ft. of the back. An opening is left at the top so that the operator may watch and control the smoke. Before blasting a small pulley is fastened behind a timber near the breast or anchored to a wooden plug in the side. A small wire rope is led from the fan *C* to the pulley and back where it is fastened to the Flexoid which is piled up at the fan. After blasting the Flexoid is quickly pulled to the breast.

The mode of procedure after blasting is as follows: The fan *A* is started exhausting and the fan *C* is started blowing. The speed with which the smoke can be

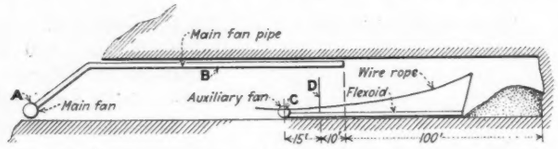


FIG. 2. ARRANGEMENT OF APPARATUS IN SYSTEM DEVISED FOR REMOVING SMOKE RAPIDLY

removed is determined by the capacity of the fan *A*. If we bring the smoke back from the breast as fast as the exhaust pipe can take it out we have attained the maximum speed possible with the equipment.

When we start blowing with the fan *C* we may force any amount to the breast—the more the better. This will clear the breast almost instantly and start the column of smoke moving out. When, however, the column of smoke reaches the exhaust, if more air is going through the Flexoid than is removed through pipe *B*, the smoke will pass the brattice and enter the fan *C* and be driven to the breast, so as soon as the smoke arrives at the exhaust pipe, a gate on the auxiliary fan is closed until no smoke passes the curtain.

As we have said, the speed with which the smoke is removed depends upon the capacity of the outside fan, but for reasons of economy we wish to do the work with the smallest amount of air that will take the smoke out in a short time, say ten minutes.

To make the smoke for the tests we used 115 grams of black sporting powder. This made a dense smoke comparable to that from a round of shots.

The lowest velocity of air from the breast back to the entrance of the exhaust pipe must exceed the critical velocity of which we have already spoken. We determined this velocity to be 30 ft. per minute. That is, the auxiliary fan must force sufficient air through the Flexoid to cause a velocity of 30 ft. per minute toward the exhaust. The amount of air taken out through the exhaust must exceed the amount blown to the breast, to prevent short circuiting. If the brattice is used as shown, the exhaust must take out 10 per cent more air than the auxiliary blows in. If the brattice or curtain is not used, the exhaust fan must take out 30 per cent more air than the auxiliary fan blows in.

We were able to clear the smoke from the tunnel in nine minutes with the black powder smoke. We shot a round with dynamite and found the tunnel clear for 40 ft. back of the breast in five minutes and completely clear in nine minutes.

Let us next see how we can use the data to select an equipment: A drift is 5 x 7 ft. or 35 sq.ft. in area. To cause a velocity of 30 ft. per minute would require a capacity for the auxiliary fan of 1,050 cu.ft. per minute. This is the minimum. A fan of larger capacity should be selected, because any amount of air can be blown to the breast before the smoke reaches the exhaust pipe. If the brattice is used the capacity of the outside fan must be 110 × 1,050, or 1,150 cu.ft. If the brattice is not used the exhaust fan must take out 130 × 1,050, or 1,365 cu.ft.

The distance from the breast to the end of the exhaust pipe is of course not fixed. This may be 150 ft. if necessary.

After the smoke is removed we have the problem of supplying air for the men to breathe and to make them comfortable. If it requires only ten or fifteen minutes to remove the smoke, we can afford to use a large amount of power during this operation. It is the steady use of power during the twenty-four hours to supply proper working conditions that makes the costs mount, so we must run the fans during this time with as small amount of power as possible and yet supply a healthful atmosphere.

The amount of air consumed by a man each minute is very small, about 1 cu.ft. We must, however, dilute such gases as may be given off from the muck. If the temperature is below 70 deg. F. it will be necessary to deliver at the breast only enough air to make an atmosphere healthful to breathe. To accomplish this, the auxiliary fan is stopped and the Flexoid is put on the main air pipe. The outside fan is reversed so that it blows, and is slowed down until enough air is delivered at the breast.

If the temperature is high and the humidity is high the best remedy is to blow in from outside a large

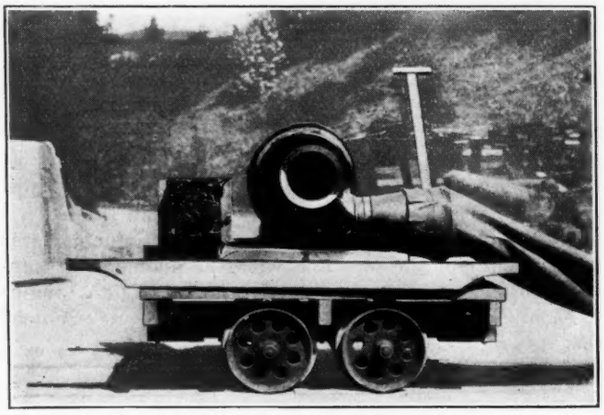


FIG. 3. AUXILIARY FAN *C*, WITH FLEXOID TUBING ATTACHED

amount of air of low humidity. In long tunnels, however, this may be economically impossible. The effect of high temperature and humidity may be counteracted a good deal by a vigorous circulation. This may be accomplished in the following manner:

Leave the Flexoid on the auxiliary fan and set the fan at the end of the main air pipe. Put an elbow and short length of pipe on the main air pipe so that the air from the outside is delivered near the intake of the auxiliary fan. Run the outside fan to deliver about 1,000 cu.ft. of fresh air and turn the auxiliary fan to deliver at the breast 5,000 or 6,000 cu.ft. The men will thus receive each minute 1,000 cu.ft. of fresh air and 4,000 or 5,000 ft. of recirculated air. The power consumed by the auxiliary fan will be small because it is blowing against a small pressure, and thus the cost will not be unduly high.

THE PETROLEUM INDUSTRY

Strikers in San Joaquin Valley Attempting "Nationalization"

Development work in the oil fields of Kern County, Cal., continues to be held up by the strike of the oil workers. An apparent deadlock prevails. D. S. Ewing, vice-president of the Oil Producers' Association of California, after a recent visit to the oil fields, gave out a statement, the following being an abstract:

"The Oilfield Gas Well and Refinery Workers of America are not organized as other organizations in the United States, for the reason that it is an industrial organization of the various crafts in the different industries. In all craft labor organizations some knowledge and experience of the business is required of the applicant for membership, but in the Oilfield Gas Well and Refinery Workers of America no knowledge whatever is required of the member before he is admitted into the organization, and all that is necessary is that the applicant either be at work in the industry or intending to go to work therein.

"No craft union has for its ultimate object 'nationalization' of the industry in which it is engaged, while the direct ultimate object of the Oilfield and Gas Well and Refinery Workers is the 'nationalization' of the industry in which they are engaged. They admit their satisfaction with the wage offered, with the working conditions, and with the hours of labor; they even admit that they are not intending to demand the closed shop, but will permit the operators in the industry to employ whomsoever they please, irrespective of affiliations with labor organizations, but boldly and publicly state that the only point of difference between them and the operators in the industry is the mediation by the Federal Government in order ultimately to bring about complete 'nationalization' of the industry.

"From the fact that this particular strike does not at present affect the whole industry even in the State of California, nor does it affect the industry in any other part of the United States, nor does it affect all of the operators in the San Joaquin Valley, irrespective of the question as to whether they have heretofore signed an agreement with this oil workers' union or not, it is apparent that the only object of this organization is to force a few of the operators in the industry to recognize the principle that the Government has the right to dictate the terms of labor contracts in private industry between these few operators and this oil workers' union, so that it may use that first step as an entering wedge upon which to compel all other operators, first in the San Joaquin Valley, to recognize this principle of 'nationalization' and thereafter to attempt to compel the whole industry in the United States to recognize this principle.

"After one industry is forced to recognize the principle of 'nationalization' then, of course, it would be easy for them to take one industry after another and force Federal governmental control upon all of those industries in such a way that sooner or later complete 'nationalization' would be put into existence. It is a noticeable fact that all statements emanating from the headquarters of the principal officers of this workmen's organization are to the effect that this strike is a 'peaceful strike,' though at the same time these statements admit that if the operators even attempt to resume operations upon their respective properties every effort which could be brought into existence on their part will be used by them to stop such operations, and of course this could only mean that destruction of property and loss of life would ensue. They do not seem to realize or recognize what a peaceful strike is when they admit the maintenance of armed patrols upon the public highways, as well as upon private property, in order to prevent the operators from doing any work upon those properties in any way; also by their admission to the secretary to the Governor of the State of California of the violation of the law in this respect and of the infringement of the rights of citizenship in the State of California.

"They knew from the inception of this strike that it was not and could not be peaceful and they also knew then and know now that the only reason that there has not been destruction of property and loss of life is that the operators themselves have refrained from asserting their constitutional rights in an attempt to operate these properties."

Northwestern Canada Oil Fields

SPECIAL CORRESPONDENCE

The Imperial Oil Co. has officially announced the striking of a 2,000,000 ft. flow of gas in the Pouce Coupe field, Province of Alberta, now being prospected. The gas was reached at a depth of 1,650 ft. Drilling began last June. At a depth of 150 ft. the drill encountered oil and gas, and since then has passed through a dark marine shale with a considerable showing of oil. A. McQueen, vice-president of the company, is quoted as saying that drilling will be prosecuted all winter in all of the Alberta fields now being tested. He asserts that drilling during the next twelve months should reach such a stage as to elicit definite information regarding the oil-producing possibilities of all the sections of western Canada now receiving attention.

Reports have been received from officials of the Mines Department, Ottawa, who have been in the Fort Norman section of northwestern Canada. They take a middle position in regard to the commercial possibilities of this field—neither optimistic nor pessimistic. They say that undoubtedly there is oil in that section, that much of the likely area has not yet been explored, but that production in large quantities is not yet in evidence. Though one gusher was struck and poured forth in volume for a time, the run has now fallen to a few barrels a day. Another boring has struck oil at 1,500 ft. but only in small quantities. The officials do not condemn the field, nor do they deny its possibilities; but on the basis of what has been discovered they are not enthusiastic, especially in view of the isolation of the territory and transportation and other difficulties.

Terry Field, Texas, Under Development

SPECIAL CORRESPONDENCE

Extensive development work will begin immediately in the new Terry field, in Orange County, Tex. The Gulf Petroleum Co. has purchased the Carbello gusher from the Edgerly Petroleum Co., and will at once install a barge line to haul the oil to Sabine until such time as increased pipe-line capacity is installed. This company is moving three new rigs into the field. The Humble Oil & Refining Co. is also shipping in two more rigs.

The White Point Oil & Gas Co. has contracted to have five wells drilled on its property in the White's Point gas field. It was in this area that a gas well ran wild for three years under an estimated pressure of 500 lb. before being capped.

Recent Patents

Zinc Extraction—No. 1,378,699. R. L. Lloyd, New York, N. Y., assignor to Dwight & Lloyd Metallurgical Co., New York, N. Y. A method for treating a zinc-bearing ore or material containing a negligible quantity of sulphur, consisting in mixing with a mass of such material a reducing agent, subjecting the commingled materials to a temperature lower than that at which zinc reduces and volatilizes, then subjecting the mass to the action of a solvent and dissolving out therefrom the zinc component. In case sulphur is present, the process given in patent No. 1,378,822 is used. This consists in roasting the ore and forming soluble zinc compounds which are dissolved out. The residue is then mixed with a reducing agent and the process of the first patent is followed for the remainder of the zinc.

Chloridizing—No. 1,388,086. E. A. Ashcroft, London, England. A process of treating ores embodying the conversion of the metallic constituents into chlorides and combining these with an alloy of heavy and light metals to effect precipitation of the extracted metals.

Pneumatic Flotation Machine—No. 1,378,920. R. S. Towne, New York, N. Y., and F. B. Flinn, Orange, N. J., assignors to Pneumatic Process Flotation Co., New York, N. Y. Each unit of this machine consists of a cylindrical body and a conical bottom. A porous plate is fitted in at the junction of the two, with a small space left around the periphery, so that the tailing may pass down into the conical bottom and thence to the next unit, or to waste.

Metallurgical Furnace—No. 1,379,083. G. H. Clevenger, Washington, D. C., assignor to Research Corporation, New York, N. Y. A furnace having a reaction zone through which material to be treated is moved progressively, and means for burning and passing a combustible gas through such zone.

Thickener—No. 1,379,095. A. L. Genter, Salt Lake City, Utah, assignor of one-half to General Engineering Co., Salt Lake City, Utah. A continuous thickening process consisting in submerging a series of hollow filter elements in the mixture being thickened, in a common reservoir; and continuously cleaning and removing the filtrate from any desired portion of the filter elements.

Zinc Smelting—No. 1,378,411. J. W. Hegeler, Danville, Ill. A preliminary treatment for the purpose of producing a fixed mixture of zinc ore and carbon, which consists in mixing ore and coal and then coking the resultant material.

Flotation Reagent—No. 1,378,562. R. E. Sayre, Pittsburgh, Pa., assignor to Metal Recovery Co., New York, N. Y. The addition of a small amount of an aldehyde condensation product to the mineral pulp before flotation.

Flotation Machine—No. 1,390,080. S. L. Boggs, Ivanhoe, Va. A machine comprising an agitation compartment, a froth overflow, and settling chamber, and means for removing the mineral concentrate and tailing.

Amalgamating Sluice—No. 1,379,417. J. W. Pollock, Sawtelle, Cal. A sluice with a riffled screen covering a cavity in which an amalgamating tray is fitted.

Book Reviews

Introduction to the Study of Minerals and Rocks. By Austin Flint Rogers, Ph.D. Flexible Cover; 5 x 7; pp. 503; 577 figures. Second Edition. McGraw-Hill Book Co. 1921. Price, $4.

This handy and useful volume is planned for use both as a textbook and in the laboratory and field. The first part treats of the properties of minerals, chemical, morphological, physical, and optical. Part II describes 175 carefully selected minerals, including all the common minerals and most of those of any special economic, geological, or scientific importance. The very common minerals, fifty-six in number, are distinguished by large type, and may thus be selected for a shorter course of instruction in mineralogy. Part III contains an elementary discussion of the occurrence, association, and origin of minerals, including a brief description of some of the more common and important rock types and also of the prominent classes of veins and replacement deposits. Part IV treats of the determination of minerals.

Mining Laws. By Calvert Wilson. Paper; 5½ x 8¾; pp. 240. Calvert Wilson, 340 Wilcox Building, Los Angeles, Cal. Price, $1.50.

This is a compilation, by an attorney, of the important mining laws of the United States and those of Arizona, California, Nevada, Oregon, and Utah. It is not a guide to solving legal problems without the aid of a lawyer, but it will be found convenient as a reference, particularly as to recent enactments. A valuable feature is the reproduction of the blank forms required by law for location and other notices and affidavits of various kinds that may be needed in handling mineral property.

Annual Statistical Report of the American Iron and Steel Institute, 1920—Cloth; pp. 96; 6¼ x 9¾. American Iron and Steel Institute, New York.

The ninth annual report contains, as in past years, the statistics of the iron and steel and allied industries of the United States and Canada. The information has been prepared in tabular form and contains most complete data on the production of pig iron, steel, steel products, and related manufactures. Materials consumed, exports and imports, and average monthly and yearly prices are also given.

Technical Papers

Oil Shale Distillation—The department of chemistry and research of the Day Company, San Francisco, Cal., has issued Bulletin No. 3, "Principles and Methods of Oil Shale Distillation," which discusses the factors governing the efficiency, economy, and oil recovery of a retort considered from the standpoint of the retort alone and eliminating the factors introduced by the type of shale or its preparation before retorting. A diagrammatic sketch and description of the Day-Heller retort are given.

Hewitt Oil Field—"Petroleum Engineering in the Hewitt Oil Field," by T. E. Swigart and F. X. Schwarzenbek, has been issued jointly by the U. S. Bureau of Mines, the State of Oklahoma, and the Ardmore Chamber of Commerce. This report treats of the various phases of the oil industry from the time drilling is begun until oil is delivered to the gathering system of the pipe line. The subjects covered are not confined to those of a purely engineering nature, but the writers have taken the liberty of discussing many practical problems as well. The report covers 132 pages and many illustrations, diagrams and charts are given.

Petroleum—The principal deposits of petroleum throughout the world are outlined in "Petroleum," a 110-page monograph of the Imperial Institute, recently issued. (John Murray, 50A Albemarle St., London, W. 1; price 5s.)

Vanadium—The University of Arizona and Arizona Bureau of Mines have recently issued Bulletin 115, Mineral Technology Series No. 26, "Vanadium," by M. A. Allen and G. M. Butler. This bulletin covers quite thoroughly the occurrence, production, uses, treatment, and other information concerning vanadium ores. Included is a list of vanadium claim owners in Arizona. It may be obtained on application to the Arizona Bureau of Mines, Tucson, Ariz.

Precipitating Copper—An article by Joseph Irving, Jr., in the *Mining and Scientific Press* for Oct. 15 (San Francisco, Cal.; price 15c.) describes experiments on precipitating copper in a Dorr vat, using scrap iron, which were carried out at the leaching plant of the Nevada-Douglas Consolidated Copper Co.

Brazilian Gold Mines—A short history of gold-mining operations in Brazil is contained in a two-page article in *Brazilian Business* for September (Rio de Janeiro; price 25c.)

Rope Drive—In *The Travelers Standard* for October (Travelers Insurance Co., Hartford, Conn.; free) is a seven-page article on the rope drive for machinery in which the principal advantages are summarized and information is given on the proper method of installation.

American Mining Congress Meets at Chicago

Mine Taxation, Standardization, the Gold and Tariff Situations, and Mining Education Among Topics Discussed at Convention —W. J. Loring Re-elected President

Written for *Engineering and Mining Journal*

QUESTIONS of real importance, such as standardization and mine taxation, occupied the attention of the delegates to the convention of the American Mining Congress held in Chicago last week. About 470 had registered by the end of the second day, and more came later in the week. This number included many coal and machinery men.

W. J. Loring was re-elected president of the organization; James F. Callbreath secretary; D. B. Wentz, first vice-president; E. L. Doheny, second vice-president; and T. T. Brewster, third vice-president.

The convention as well as the machinery exposition was in full swing by the evening of the first day, a fact in itself complimentary to the management. The sessions of the former were held either in the Congress Hotel or in the hall of the Coliseum, adjoining the exposition floor. Sessions on standardization and the formal opening of the exposition comprised the first day's program. The feature of the latter was a message from President Harding commenting on conditions in the coal industry. Mayor Thompson, of Chicago, was to have greeted the delegates, but sent the Corporation Counsel instead, who welcomed all to the city.

The Standardization Conference

The Standardization Conference was stretched over several days, as were most of the other conferences. Charles A. Mitke, the chairman of the Metal Mines Branch, was absent, being in South America. T. O. McGrath, of Bisbee, Ariz., acted in his place. The only subcommittee of this branch to present a completed report was that on Underground Transportation, the others merely reporting progress. This was largely owing to the fact that so many plants have suspended operation during the year and so curtailed the forces that the data necessary to complete the reports were unobtainable.

According to Mr. Mitke's report, the Metal Mines Branch at present consists of nine subcommittees, covering the following subjects: Drilling Machines and Drill Steel; Underground Transportation; Fire Fighting Equipment; Steam-Shovel Equipment and Operations; Mechanical Loading Underground; Metal-Mine Ventilation; Mine Timbering; Mine Drainage; and Metal-Mine Accounting.

All of these committees have been at work, and though the progress made thus far is such that it does not readily lend itself to publication, it is of the utmost importance in paving the way for the standards which the committees hope eventually to evolve.

The standardization movement, according to Mr. Mitke, is not a matter for immediate decision, but rather a slow growth, the details composing the various units of standardization being worked out by engineers in various mining camps throughout the country. In this connection the report states that there are general inquiries by the various departments of leading mining companies for simpler methods, a more economical classification of products, a reduction in the number of stages of routine, and an extension of the previous standards to much further dimensions. Naturally, these inquiries are largely in the nature of investigations, which are taken up and discussed pro and con before they can be crystallized into local standards. The work of the Metal-Mines Branch has been extended during the present year by the addition of two new committees on metal-mine accounting and metal-mine drainage.

Both the metal and the coal sections of the Standardization Division of the American Mining Congress are working harmoniously with the American Engineering Standards Committee, the U. S. Bureau of Mines, and other mining organizations interested in the standardization movement. It is believed that this co-operation will be of the utmost importance when the time arrives for the formation of national standards and their adoption by the metal and coal industries.

The subject of standardization was considered from other angles in a number of addresses. S. J. Williams, of the National Safety Council, spoke on "Safety and Standards"; C. R. Thomas, editor of the *Professional Engineer*, on "Standardizing Research Results Through Public Information"; C. E. Lesher, of *Coal Age*, on "The Mining Industry's View of Standardization"; and P. G. Agnew, secretary of the American Engineering Standards Committee, on "Industrial Standardization in Europe." C. E. Butterfield, of the Associated Companies, had for his subject the "Benefit of Standardization as Reflected by Insurance Rates."

Among the other papers on the subject was a brief one by Colonel Warren R. Roberts, chairman of the Coal Section, on the important subject of "National Co-ordination of Standardization Through the General Correlating Committee." This necessary committee, which reports to the American Engineering Standards Committee, was organized last year, and its method of functioning was sketched by Colonel Roberts.

The Conference on Mine Taxation

The Conference on Mine Taxation had as its object the gathering of facts on taxation, so that they might be placed in the hands of the state legislatures to secure more uniform taxation laws. Paul Armitage presided over the sessions, with McKinley W. Kriegh, head of the Tax Division of the congress, as secretary.

According to Mr. Armitage, three distinct and mutually inconsistent points of view as to taxing mines have prevailed; namely, a policy of subsidation; a policy of equalization; and, lastly, a policy of penalization of mines. In recent years among the states there has been a progressive movement toward penalization. This movement has been growing in force, according to Mr. Armitage, until in certain states mines are in the position where they cannot operate against it. Mines are national, in part international, not local, and in that respect are distinct from real property. They do not sell their product in the state, but over the entire country in competition with mines of other states and other countries, and, therefore, uniform taxation was greatly needed.

General N. W. MacChesney, of the National Conference of Commissioners on Uniform State Laws, described the method of operation of that body and indicated the difficulties to be encountered in securing uniform tax legislation. His organization, he said, had not contributed much in this direction, principally because each state regarded the matter as its own concern. On the other hand, he declared, there is a growing feeling that a state cannot afford to penalize its own industry so as to drive it away. If the matter were approached from this angle, he said, some progress might be made. The National Conference of Commissioners on Uniform State Laws could be of real service, if desired, in formulating an act which would stand a chance of passing in the various states, particularly if backed by the Mining Congress in the legislatures.

Robert N. Miller, formerly Solicitor of Internal Revenue, was firmly convinced that the movement toward uniform state taxation was very important. If the movement started now, said he, and took fifteen years to develop to fruition in a reasonable number of uniform state tax laws on mining, it still would be worth while to start now. The reason why state laws are so often poor in theory is because of the lack of understanding of fundamentals, but this would improve as the matter is more extensively discussed and understood.

The idea seems to be growing, said Mr. Miller, that a man has no right to buy natural resources, and that if he has paid a million for them he has bought something in which the people have no right to trade. This idea is wrong, he said. Another point made by the speaker was that there is a natural restraint on the taxing power even when directed against a small class, if the people of the taxing sovereignty need the product. After they have gone a certain way in taxing a small group, they begin to wake up and find the supply of what they need is falling off. This restraint was lacking in the case

of mine taxation, because mine products are not consumed locally.

The mine tax situation in New Mexico and Colorado was outlined briefly by Judge E. C. Stimson. He characterized taxation as an effort to get the most feathers from the goose with the least squawking. He gave the salient points of the recently enacted mine taxation law of New Mexico.

Mine taxation in Montana was discussed by Dan Kelly, an attorney of the Anaconda company. It was his judgment, said Mr. Kelly, that taxpayers' rights are better protected by constitutional provisions that are inflexible and furnish the same yardstick for everybody. The method of assessing mines in Montana is prescribed in the constitution of the state.

The classification law passed in the last two years provides in substance that all property be originally valued at its full cash value. The average levy in Montana is a tax on slightly over 30 per cent of the actual value, whereas the proceeds of mines are taxed at 100 per cent, thus putting Montana in the same position as Utah.

All taxes considered, the total is such that in one year, for instance, the Anaconda company paid $20.13 out of every $100 that went into the State Treasury. In concluding, Mr. Kelly stated that uniform laws will not necessarily mean uniform taxes.

Mine taxation in Minnesota was discussed by J. G. Armson, of the Minnesota Tax Commission, who described the method pursued by the commission in valuing iron ore in the ground for purposes of taxation and the steps by which this valuation was finally determined.

The total of taxes levied for all state and local purposes on mineral property in 1920 amounted to $20,255,223, according to Mr. Armson. Of this amount the state levied $1,603,119 and the counties and local districts $18,652,104. He later stated that the total in 1920 was much the greatest ever levied.

Some instances of local levies were cited by Mr. Armson. The average per-capita levy for local and school purposes in seventy-seven cities and villages in the state, not situated in the mining districts, was $31.89 in 1920, and in seventeen cities and villages in the mining districts the average per-capita levy for local and school purposes last year was $164.29. In one village of about 2,000 inhabitants the levy represented a per-capita tax of $557.28 for every man, woman, and child in the village. Another village levied $320.16; one $263.15; and another $244.91, and Hibbing, the so-called "richest village in the world," had a per-capita tax levy for local and school purposes of $222.13 for each of its 15,000 inhabitants. A bill was passed at the last Legislature limiting the per-capita levy for local and school purposes to $160.

A paper explaining the laws of Mexico in reference to the taxation of mines was read by L. de Silva, specially commissioned by President Obregon.

The local mine tax law of Utah was the subject of a brief talk by J. C. Dick, formerly head of the Natural Resources Division of the Income Tax Unit at Washington. Mr. Dick said that the valuation of mines for state purposes, for Federal purposes, or for another purpose involved three different and distinct principles. The valuation of mines for state tax purposes is altogether a state issue, according to Mr. Dick. The method used in one state might not be applicable in another.

Mr. Dick said also that the net-proceeds method of taxing or valuing mines was fair, declaring, "I believe that three times the net proceeds is right. . . . Maybe three times is pretty near the value of the mines in Utah and pretty near the share of the tax that the mining industry should pay. The mining industry of Utah wants to pay its full share, of course." In determining the full share, Mr. Dick thought that the millions spent in prospecting and finding these mines should be taken into account.

Charles R. Howe, chairman of the Tax Commission of Arizona, discussed the system of taxing mines in that state. This, he explained, is predicated on three things: First, the needs of government; second, the ability to pay; and third, the wasting asset with reference to the future of the state. The principal advantages claimed for it are elasticity, avoidance of peaks and hollows or lean years and fat years, and, lastly, equalization of the burden within the state.

The tax system of Michigan was characterized by L. B. Barrett as being purely an ad valorem system. All property in the state is assessed at its full value. There is no classification of property for tax purposes, and no attempt is made to treat mines in a differ manner than that applied to farms.

The Gold Conference

The reply of Senator Oddie[1], of Nevada, to the statement of Secretary Mellon, of the Treasury, which dealt with the resolution on the gold situation recently presented to him by twenty-two Western Senators, was given out in time for it to be the feature topic of the Gold Conference, which was presided over by H. N. Lawrie, economist of the American Mining Congress. Another question of great importance that received attention was that of exchange stabilization. A bill (H. R. 8404) has been introduced recently at Washington calling for an international conference to study this problem. A large amount of data on this subject was recently placed by Mr. Lawrie before the House Committee on Banking and Currency, and this material formed the nucleus of the discussion at the conference. A feature of this data was a series of nine charts giving the exchange fluctuation for as many countries from 1918 to date.

[1]Printed on p. 704.

The Tariff Conference

The Fordney Tariff Bill having passed the House and being before the Senate Finance Committee, there was little for the Tariff Conference to do. Herbert Wilson Smith, chief of the tariff division of the Mining Congress, presided at the sessions, the discussions at which were of an informal nature and bore on the varying needs and hopes of the different producers. A chart recently prepared by Mr. Smith, giving all necessary statistical information about every mineral produced in the country for which tariff protection is sought, was found very valuable.

The Educational Conference

The Educational Conference was formed in St. Louis in 1919 and met in Denver last year. Its purpose is to discuss problems in mining and metallurgical education and those of the State Geological Surveys and other public-service organizations relating to mining. This year's meeting was confined to mining and metallurgical education. It was conducted under the chairmanship of Charles H. Fulton, of the Missouri School of Mines, and practically all of the mining schools had representatives in attendance. The committee decided to continue its activities under the auspices of the American Mining Congress, as the annual meeting of the congress affords an exceptional opportunity for those engaged in this work to exchange views and opinions aside from taking formal action.

The principal subject discussed was "What Is the Scope and Content of a Modern Course in Mining or Metallurgy?" In this connection a paper on "Can an Efficient Course in Mining Be Given in Four Years?" by Prof. Robert Peele, of Columbia University, was read, and fully discussed. Prof. J. R. Nelson, of the University of Michigan, read a paper on "The Development of a Special English Course for Engineering Students." The subject of mathematics in the mining and metallurgical course was presented by Dean Francis A. Thomson, of the School of Mines of the University of Idaho, and was discussed at length and with considerable difference of opinion. President C. C. O'Harra, of the South Dakota School of Mines, spoke on the desirability of some revision of the mining curriculum to permit the introduction of biological subjects and other studies necessary to an understanding of life and human relationship in industry. Prof. Arthur L. Walker discussed the six-year course in mining and metallurgy offered by Columbia University and elicited much interesting comment. A paper by Prof. E. A. Hersam, of the University of California, on "The Training in College for the Practice of Metallurgy," was read in abstract. Prof. F. W. Sperr, of the Michigan College of Mines; Carle R. Hayward, of the Massachusetts Institute of Technology; Dean P. F. Walker, of the University of Kansas, and Dean G. M. Butler, of the Univer-

sity of Arizona, made remarks on the subjects under discussion.

Interesting Topics Discussed at General Sessions

Though the consideration of particular subjects took most of the delegates' time, several sessions of a general nature were held. At these the opportunity was afforded of hearing many speakers whose talks were of especial interest. Francis S. Peabody, who figured so prominently in the handling of the nation's coal problems during the war, unburdened himself for the first time of some long-pent feeling over the conduct then of certain Government officials, including Secretary Baker and Secretary Daniels. Edwin Ludlow, president of the A. I. M. E., in a speech entitled "Coal and Labor," discussed the anthracite and bituminous situations briefly.

At another session Governor Preus of Minnesota made one of the most interesting speeches of the week. Starting by telling how he had refused to cancel the lease of the Steel Corporation on certain iron-ore lands of great value on the Mesabi Range because of the company's refusal under protest to pay certain taxes, and giving his reason therefor, the Governor launched into a discussion of the growth, aims, and methods of the Non-Partisan League in his state and elsewhere, there being a natural bridge between the two topics. It was Governor Preus who signed the occupational tax bill recently enacted in Minnesota.

The Government policy as applied to conservation was the target of another speaker, Falcon Joslin, of Seattle, who, in discussing the needs of Alaska, said that the territory is losing population at the very time when the Government is building a railroad. Furthermore, said he, Washington is too far away to be the seat of the territory's government. For any wrong, he said, the early Russians in Alaska had a saying, "Heaven is high and Moscow is far away," and today Washington is almost as far as Moscow was then.

Senator Nicholson, of Colorado, spoke on behalf of his bill, now pending in the Senate, providing for the creation of a Federal Department of Mines.

A special session devoted to a discussion of methods for increasing the use of metal products was, somewhat to the surprise of some delegates, only slightly attended. Sidney J. Jennings spoke on "Some Methods for Increasing the Use of Silver." The use of silver as money, he said, presents great possibilities, in view of the present currency situation abroad. T. D. A. Brophy, of the Anaconda company, discussed the subject of "Copper, a Metal of Commerce." Henry George, of the Chase Metal Works, of Waterbury, Conn., spoke on the "Commercial Future of Copper, Brass, and Bronze." An interesting paper was one on "Future Electrification in the Development of the Mining Industries," by G. B. Rosenblatt and Graham Bright. Eugene H. Wolff, president of the American Zinc Institute, presented a paper on the "New and Extended Uses of Zinc Products."

A smoker held at the Coliseum during the week was well attended, as was the annual banquet at the Congress Hotel on Oct. 21. Charles M. Schwab delivered a forceful address at the latter, rapping the Government's "meddling," as he termed it, in the coal situation.

Resolutions Adopted

The resolutions adopted were as follows:

Gold and Exchange Situations. A resolution adopted by the Gold Conference expressing appreciation of the activities of Senator Oddie, of Nevada, in support of the gold standard and pledging support to the principle that the consumption of gold in manufactures and the arts should be curtailed and the production of new gold stimulated; also endorsing Bill H. R. 8404, introduced by Representative Louis T. McFadden, providing for a conference of representatives of Great Britain, France, and the United States to investigate the subject of exchange stabilization.

Department of Mines. A resolution introduced by W. J. Loring indorsing Bill S. 1957, introduced at Washington by Senator Nicholson, of Colorado, which provides for centralizing all Governmental activities related to the mining industry in one department to be presided over by a Secretary of Mines, who would be a member of the President's Cabinet.

Mining Law Revision. The full text of this resolution, introduced by Horace F. Lunt, of Colorado, is as follows:

"Whereas, the metal mining laws of the United States have been in effect for more than fifty years and during that long period have been interpreted and made definite by a vast number of rulings and court decisions—and while the law may have some defects, the tremendous development of the mining industry under its provisions proves it to be one of the best mining laws in the world; and,

"Whereas, any general revision would in all probability have as many, if not more, defects than existing law and would, in addition, unsettle the great system of mining law which has grown up through so many years of experience and interpretation; and,

"Whereas, it would be easy to correct the defects in the existing law such as the extralateral rights provision by a simple amendment without disturbing the great body of the mining law which has worked so well;

"Now therefore, it is the sense of your committee that any general revision of the metal mining laws at this time is unwise and inexpedient; and be it

"Resolved, That the board of directors of the American Mining Congress be instructed to appoint a committee to ascertain, as quickly as possible, the opinions of other mining men of the states affected by the proposed revision regarding the necessity for changing the present mining laws and the desirability of the changes embodied in R. No. 7736; and, be it further

"Resolved, That the Mining Congress use its efforts to further the desires of the majority of mining men of the states affected by the proposed revision as so ascertained."

State Mine Taxation. A resolution introduced by the Tax Conference reads as follows:

"Resolved, That the president of the American Mining Congress appoint a committee of not less than ten, with authority to increase its number, to study the question of state taxation of mines within the several mining states of the Union and to make a report to the secretary of the congress as soon as practicable."

State Tax Legislation. Omitting the preamble, the text of a resolution introduced by E. C. Stimson is as follows:

"Be it Resolved, That the American Mining Congress protest against all such forms of taxation which directly or indirectly discriminate against mining property or mining enterprise and all forms of taxation which have for their purpose the object of obtaining any greater amount of revenue from mining property or mining operations than is obtained from other property."

Alaskan Government. A resolution introduced by Falcon Joslin reads as follows:

"Whereas, the development of the great territory of Alaska is a subject of national importance, but a serious decline in the population of the territory is taking place; and whereas, the form of government of the territory, with its administration distributed through a great number of bureaus, boards, and commissions, acting without co-ordination from Washington, where the law-making power also rests, 4,000 miles and more away, has been mainly responsible for the ill-adapted or unworkable policies under which the territory is suffering; now therefore be it

"Resolved by the American Mining Congress in convention assembled, That it is the sense of this organization that the restrictive policies in effect in Alaska should be reversed and the resources there opened for development on the most liberal terms, and

"Resolved, further, That it is the sense of this organization that the government of Alaska should be reorganized and its administration consolidated and placed within the territory and made directly responsible to the President."

Economic Education. The text of a resolution introduced by A. G. McGregor reads as follows (omitting the preamble):

"Be it resolved that the American Mining Congress in convention assembled does hereby indorse a program of sound business education with the end that labor will better understand the problems of capital and capital will better understand the problems of labor and thereby hasten a return to normal industrial activity upon which the employment and well-being of all our people depend."

Railroad Rates and Wages. The Text of this resolution, introduced by William J. Loring, is as follows:

"Whereas, all commercial progress is based upon transportation, no commodity being of any value until it is removed from the place of its original location; and,

"Whereas, the transportation facilities furnished by the railroads of the

United States have been a controlling factor in the development of our industries; and,

"Whereas, a large part of the costs of transportation are based upon the wages paid to the labor employed in its operation; and,

"Whereas, at the beginning of the war the wages paid to railroad operatives were equal to or above the average paid for similar service in other activities; and,

"Whereas, during the war the increasing cost of living made necessary increases in the wage scale to all labor, and particularly high increases were granted to railroad operatives; and,

"Whereas, because of this increased cost of operation the transportation rates of the railroads were of necessity increased in approximate proportion to the increase in wages; and,

"Whereas, the costs of living are gradually decreasing; and,

"Whereas, wages in other lines have been decreasing, and living costs to wage earners in other lines which have accepted reductions would be more nearly commensurate if costs of transportation could be reduced; and,

"Whereas, the last advance in wages granted by the railroads to their operatives was approximately 25 per cent, which increase in wage resulted in an increase in freight rates of approximately 35 per cent; and,

"Whereas, the cost of living now is less than at the time when the wage scale was fixed, to which the 25 per cent increase was added, and, further, a reduction in freight rates would immediately reflect itself in a further reduction in living costs; and,

"Whereas, high freight rates furnish a continuing barrier to a return to normal conditions, which freight rates cannot be materially diminished so long as the present wage scale is in effect; therefore, be it

"Resolved . . . That we urge the railroads of the United States, in conjunction with the Interstate Commerce Commission and the Railway Labor Board, to order immediately that at some early date the last increase in freight rates will be abolished for the benefit of shippers, and that at the same time the last advance which was granted to the railroad operatives will be rescinded; and. be it further

"Resolved, that we pledge the indorsement and full support of the mining industry of the United States to the railroads in their effort to simultaneously reduce rates and wages to the level existing before the last increases were made."

Tariff. A resolution introduced by the tariff committee urges that the tariff schedule proposed in the Fordney bill be sustained before the Senate Finance Committee and that the proposed amendment be speedily enacted; also that the committee consider the needs of those mineral industries not yet adequately protected.

American Valuation. A resolution introduced by the Tariff Conference reads:

"Whereas, in order to provide tariff duties which shall adequately protect the industries to which the mining industry furnishes its products as basic materials, a method of valuation must be established which will prevent the dumping of undervalued foreign products in times of industrial depression, be it

"Resolved, That the American Mining Congress indorses the broad principle of American valuation, and leaves to the wisdom of the Congressional committees the determination of the administrative methods necessary for its proper application."

War Minerals Relief. A resolution introduced by the War Minerals Relief Committee commends the attitude of Secretary Fall as expressed in his letter of June 2, 1921, indicating a desire to achieve justice and equity for war mineral claimants. It also commends the sympathetic consideration of the House and Senate committees on Mines of means for securing relief and urges support of the needful additional legislation.

Colorado River Project. A resolution introduced by the Arizona delegation urges the Federal Government to proceed at once to complete investigations needed for this undertaking and to provide funds for building the first unit.

Conference With Secretary Hoover. This resolution provides that, in response to certain requests from President Harding and Secretary Hoover, a committee be appointed, of which the president and secretary of the American Mining Congress shall be ex-officio members, from the representative mineral producers of the United States, to confer with the Secretary of Commerce and assist in developing methods and plans of mineral production and distribution that will improve present conditions and aid the Secretary of Commerce in his effort to render greater service to the mineral industry.

Sherman Act Amendment. This resolution, introduced by S. M. Evans, reads thus:

"Whereas, the public interest will be served by conservation and the lowering of costs of the necessaries of life and the requirements of commerce; and,

"Whereas, better co-operation between the producers and distributors of these necessary commodities will serve the public interest; and,

"Whereas, certain of our laws now prevent, or fail to provide for, such necessary and beneficent co-operation in such production and distribution of products in the public interest; therefore be it

"Resolved, That the American Mining Congress advocates such revision of the laws as will enable those engaged in mining and other industrial production and distribution to apply in the conduct of all the great branches of our national industries the necessary principles of conservation in production, economy in distribution, greater co-operation with labor and the consuming public, to the end that labor in the mining industry may be relieved of the burden of intermittency of operation, and the products of our mines and industries delivered to the ultimate consumer at the lowest possible price.

"More specifically, we recommend that Congress so amend the Sherman Anti-Trust Act as to vest in miners, manufacturers, and distributors the right to collect, collate, and distribute to themselves, and to the public, statistics of their operations, thus relieving our mining and other industries from the necessity of operating in ignorance of existing stocks, current production, and current demand."

ECHOES FROM THE FRATERNITY

SOCIETIES, ADDRESSES, AND REPORTS

E. A. Holbrook Defines School Function in Mining and Like Investigations

In a recent address before the Pennsylvania State College, E. A. Holbrook, assistant director of the U. S. Bureau of Mines, spoke in part as follows:

"The function of the technical colleg in industrial research in the mining, metallurgical, and ceramic industries is both basic and necessary. Broadly speaking, the day is past when sheer inventive ability alone is able to advance these industries and their allied arts. Rather, progress comes through research, the finding of truth by a study of the fundamentals involved, and the ability to apply new principles and processes to the further development of an art.

"It seems popular to criticise adversely the present-day technical college and the shortcomings of its work and output. Yet from the word of men who were graduated in technical courses forty or fifty years ago we must see that real progress has been made, and I, for one, am satisfied that the average technical school today is able to take raw material and in four short years so to train it as to produce men whose minds have an engineering sense, and who because of this will be able increasingly to give this country's affairs an engineering point of view, and to justify their individual existence in industry. The modern technical college, therefore, is justifying its present methods by the quality of its output.

"The Bureau of Mines, with its nearly 300 college-trained engineers, metallurgists, and chemists, engaged primarily in research in the mining, metallurgical, and ceramic industries, offers a measuring stick by which to gage the success or failure of the technical college man in industrial research. Do men from school A make better investigators than men from school B or C? I frankly state that there are several technical schools in

this country that furnish us with a high percentage of successes among their product. On the other hand, one of our most successful investigators is a product of a college from which most of the graduates we have employed have not taken readily to our work.

"The practical way it works out with the Bureau is as follows: A technical investigator in mining or metallurgy or ceramics is needed. He must be a graduate of an approved technical college. He must have had more or less practical experience in operating or with engineering of mines or plants.

"It is a popular fallacy, both among students and the profession, that it is the brilliant student alone who is the successful research type. This is not so. To be a successful investigator the man must first of all have a thorough grasp of fundamental physics, chemistry, English, and mathematics. Second, he must possess a natural curiosity, which enables him to 'skillfully eliminate the obvious' detail and follow the main objective. Third, he must have what is best called vision. Not the ability to imagine impossible things or to be eccentric, as some believe, but the ability to assemble known facts from a wide field and project them into an uncharted area.

"The function of the technical college in industrial research is the training of the men. Nowhere else can they so quickly grasp the fundamentals; in no other place can they so readily, under competent guidance, discover their natural bent, as in no fitter place can be fostered and developed those inherent characteristics necessary for moral, mental, and professional success in research."

Geographical Research in Latin America Planned

A scheme of geographical research in the countries of Latin America has been undertaken by the American Geographical Society of New York. This plan, upon which work was started a year ago, has for its general aim the collection, classification, scientific study, and publication of all facts which bear upon the geography, physical and human, of the whole continent south of the United States. An important part of the work is cartographic, and the society hopes to help materially the production of the International Map of the World on the scale of 1:1,000,000 by compiling a number of sheets of this map and devoting special attention to those which apply to countries whose governments are not yet in a position to undertake the work. The sheets will conform in style as closely as possible to the resolutions of the International Conference on the Millionth Map held in 1913; i.e., they will each cover six degrees of longitude and four of latitude. They will be contoured and colored to indicate relief by the layer system of tints. Three sheets have been undertaken so far, and one of them, the "La Paz" sheet, bounded by 16 deg. and 20 deg. S. and 66 deg. and 72 deg. W., will be printed soon.

It is hoped that even confidential maps may be made available to the society, where they will be employed or consulted only under conditions established by the donor, and will be returned if desired.

Any material may be addressed to Alan G. Ogilvie, American Geographical Society, 3755 Broadway, New York City.

Four Founder Engineering Societies Meet in New York

A joint meeting of the Metropolitan sections of the four national societies, the A. S. C. E., the A. S. M. E., the A. I. M. E., and the A. I. E. E. was held in the Engineering Societies' Auditorium on Wednesday, Oct. 19, being preceded by a dinner at Browne's Chop House. Arthur B. Leach, a New York banker, spoke on the "Financing of Large Engineering Undertakings." He emphasized the inflation of money values and urged engineers to make present equipment as efficient as possible before embarking on new undertakings. Philip Cabot, of Boston, in discussing "The Engineer a Failure as a Financial Manager," dwelt on the lack of vision and imagination which he said characterized most engineers. Discussion was led by J. H. Williams, of Day & Zimmermann, and Calvert Townley. This was said to have been the first time that the four founder societies had met together, and the auditorium was crowded. It is unfortunate that the topic of the evening did not provoke as interesting discussion as those in attendance expected.

MEN YOU SHOULD KNOW ABOUT

D. A. Richardson, of Douglas, Ariz., will open an office in El Paso on Nov. 1.

C. W. Purington is visiting New York and will sail from Victoria for Japan on Nov. 18.

Louis A. Wright will arrive in New York from Obermais, Merano, Italy, about Dec. 1.

J. B. Tyrrell is inspecting mining properties in the Caribou district of British Columbia.

H. B. Gillis has been appointed superintendent of the mines and quarries of the British Empire Steel Corporation.

Samuel W. Cohen was the official representative of the University of Minnesota at the McGill University centenary.

J. J. Warren, president of the Consolidated Mining & Smelting Co. of Canada, has moved his headquarters from Toronto to Montreal.

F. S. Norcross Jr., who recently returned from a three months' trip in Central America, has left for eastern Oregon on professional business.

Frederick Bradshaw, general manager of the Tonopah Belmont Development Co., with headquarters in San Francisco, is in Tonopah inspecting the property of the company.

O. S. Finnie, of the Mining and Yukon Branch of the Canadian Department of the Interior, has returned to Ottawa after spending the summer in the Fort Norman oil fields.

F. P. Williams, formerly an engineer with the War Minerals Relief Commission, has left for the Alamos district, Sonora, Mexico, to take charge of the reopening of a silver mine.

A. E. Perkins, western manager of the Colonial Steel Co., has recently returned from an extended trip to the various mining camps of Alaska, which he made in the interest of the company.

Stephen L. Kaffer, formerly chief engineer of the Burro Mountain Branch of the Phelps Dodge Corporation, at Tyrone, N. M., has accepted a position with the Mine & Smelter Supply Co., at El Paso, Tex.

Floyd W. Parsons, formerly assistant editor of *Engineering and Mining Journal*, later editor of *Coal Age*, and, for the last two years, in charge of the department entitled "Everybody's Business," in the *Saturday Evening Post*, has become editorial director of the *Gas Age-Record*.

A. E. Bendelari, vice-president of the Eagle-Picher Lead Co., who is also a member of the board of directors, has been given charge of the ore buying details of the Tri-State district, which formerly were under the direction of J. Edward Webb, who retains the management of the Joplin smelter and lead products plant.

Mining and Metallurgical engineers visiting New York City last week included **W. R. C. Russert**, of Butte, Mont.; **R. C. Allen**, of Cleveland, Ohio; **E. M. Sawyer**, of Tyrone, N. M.; and **W. E. Wrather**, of Dallas, Tex.

SOCIETY MEETINGS ANNOUNCED

American Association for the Advancement of Science, engineering section, will hold a meeting in Toronto on Dec. 27 to 31. The arrangements for the engineering sessions are in charge of J. B. Tyrrell.

The New York Sections of A. I. M. E., A. S. C. E., A. S. M. E. and A. I. E. E. will hold a joint meeting at the Engineering Societies Building on Nov. 14 to discuss the St. Lawrence ship channel and power project. Speakers will be Governor H. J. Allen of Kansas; Governor W. L. Harding of Iowa; Dr. R. S. MacElwee, of Georgetown University, and H. I. Harriman, of Boston. W. L. Saunders will preside.

The American Society of Mechanical Engineers will hold its annual meeting in New York City, Dec. 5 to 9. The report of the Committee on Elimination of Waste in Industry of the American Engineering Council will provide the basis for the discussion, which will emphasize the engineering phases of the waste problem.

THE MINING NEWS

The Mining News of ENGINEERING AND MINING JOURNAL is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Leading Events

Senator Tasker L. Oddie has replied to the statements of Secretary Mellon regarding the remedy for the gold situation proposed in the McFadden bonus bill. His letter is published in this issue.

The plant of the Eagle-Picher Lead Co. at Joplin, Mo., is being equipped to make lead products.

At Babbitt, Minn., the Mesabi Iron Co. has tried out the power and coarse-crushing units of its new plant for concentrating low-grade iron ores.

Of considerable importance to the future mining industry in the Southwest are the steps now being taken to harness the Colorado River for the generation of hydro-electric power. This matter is briefly told this week.

All is not dead in the Joplin-Miami district. P. R. Coldren, correspondent there for *Engineering and Mining Journal*, reports increasing activity as prices of zinc and lead ore strengthen.

United Verde, at Jerome, Ariz., has decided to begin construction of its million-dollar crushing plant at once.

In northern Michigan the Mohawk Mining Co. has begun suit against the Federal Government to recover $125,000 for use of its railroad during the period of Government control.

The state tax rate on mining properties in Michigan has been considerably reduced for the current year.

In northern Ontario, the T. & N. O. Ry. has secured the power site on the Abitibi River sought some time ago by the Hollinger Consolidated Gold Mines.

Floods are said to have caused damage in the Salmon River and Alice Arm districts in northern British Columbia.

It is rumored that the Anaconda company may run part of its Washoe smelter on silver ores; also that the Asarco smelter, in Durango, and the Velardeña mines are about to resume.

Planning To Harness the Colorado River

Project of Great Importance to Future Mining Industry in Southwest

Of tremendous potential interest to the mining industry of the Southwest are the plans now being made for utilization of the hydro-electric energy of the Colorado River. The Southern California Edison Co. is proposing development of over 4,000,000 hp. by a 550-ft. dam at Lee's Ferry, backing a storage of 40,000,000 acre feet far up into Utah, and by smaller dams a few miles below the ferry and at three points below the canyon. Still more electric energy is to be developed by the Boulder Canyon project of the Reclamation Service, which primarily is for storage of 20,000,000 acre feet of water, somewhat more than a year's average discharge.

For years J. B. Girand, of Phoenix, has been surveying near the mouth of Diamond Creek, in the lower part of the canyon, planning power works on behalf of the Jackling mining interests, of Arizona, Utah, and Nevada. Girand's filings are the only ones thus far accepted by the Interior Department. It has been suggested that, with lessened costs, electricity in the future might become an effective ore-reduction agent, with especially large saving in the present excessive fuel transportation costs. At present, hydro-electric power is used in Arizona only by the Inspiration and Magma plants, at Miami and Superior, furnished by the Roosevelt works of the Salt River Valley Water Users' Association, which has available only about 25,000 hp., which is consumed mainly in agricultural pumping, manufactures, and civic lighting and power.

Reno Meeting Against Revision Of Mining Law

A meeting was recently called by the Chamber of Commerce of Reno, Nev., to discuss the Mining Law bill, H.R. 7,736. About fifty members attended, largely prospectors and claim owners. The majority opinion favored the existing laws and the rejection of the proposed changes.

Mesabi Iron Co. Tests Crushing Unit at Babbitt

An encouraging test run has been made of the power plant and coarse-crushing unit of the Mesabi Iron Co., at Babbitt, Minn. The ore, loaded by steam shovels, is brought to the plant and dumped into receiving bins, from which it is fed to the first jaw crusher by an apron feeder. It then passes to a second crusher of the jaw type and from here it is distributed to four gyratory crushers of large size. The two jaw crushers are the heaviest machines of their size made, the first one having a jaw opening of 4 x 6 ft. and capable of handling any size of rock that can be loaded by the steam shovels into the cars. The final product from the gyratory crushers will be approximately 1 in. or less. The other units of the plant are not quite complete, but will be in the near future, it is anticipated.

Eagle-Picher Lead Co. Equipping To Make Lead Products

Business Already Received Reported Encouraging—New Warehouse Roofed With Zinc

BY P. R. COLDREN

About $15,000 worth of special machinery is being installed by the Eagle-Picher Lead Co. at its plant in Joplin, Mo., for use in the manufacture of lead traps, bands, and ferrules, and also for the manufacture of wire solder. The company went into the lead-products business at its Joplin plant some months ago, and reports that the business received has been encouraging. It has just completed a warehouse, 120 x 75 ft. in dimensions, for the purpose of storing lead pipe and plumbers' supplies, so that more room may be provided in the manufacturing building. The new warehouse has been covered with a roof of 12-gage corrugated zinc sheets, and is so designed that the roof can be raised and a second story built whenever occasion may demand.

Engineering and Industry Building Proposed in San Francisco

Plans are under way for interesting a large number of engineers of San Francisco in an enterprise for constructing and operating a twenty to twenty-five-story office building which would be recognized as a center of engineering activity. The movement is fostered by the San Francisco Electrical Development League, which estimates the cost of the project at about $2,000,000.

NEWS FROM WASHINGTON

By PAUL WOOTON
Special Correspondent

Oddie Replies to Mellon on Gold Situation

Debates Points Raised Against McFadden Bonus Bill by Secretary of Treasury in Answering Resolution Presented by Western Senators Recently—Asks for Further Reply

REPLYING to the Secretary of the Treasury for the Senators from the gold-producing states, Senator Oddie, of Nevada, makes an extended plea for the McFadden bill and takes exception to several of Secretary Mellon's conclusions. It is Senator Oddie's contention that the industrial consumption of gold should be curtailed forcibly and the production of gold stimulated by the enactment of this legislation. He points out that the bonus which would be paid for new gold would not be paid by the general public but would be paid by the consumers of luxuries who have the ability to pay.

Some such step must be taken or the maintenance of the gold standard will be seriously threatened, Senator Oddie believes. Unless we assist some nations in their effort to recoup their gold stocks, Senator Oddie believes they will adopt some other unit on which to build their currency systems; not that they want to do it, but because they will be forced to do it. Another striking point in Senator Oddie's letter is his contention that the difficulties of the deflation period were enhanced greatly and unnecessarily by the heavy industrial drain upon our gold reserve.

In the preparation of his reply to Secretary Mellon, Senator Oddie worked literally day and night so as to complete it in time to have it read at the Chicago convention of the American Mining Congress. Extracts from the letter follow:

"You have expressed the opinion in your letter of May 9 to the chairman of the Committee on Ways and Means, and in your letter of Sept. 30 to me, that as commodity prices return toward normal and costs become stabilized on a lower level, relief should gradually come in the ordinary course of events from the difficulties of which the gold-mining industry has been complaining. The wholesale index number of the Bureau of Labor Statistics has been recently ascending over the low point established in June and still remains over 50 per cent above the wholesale price level of 1913. This would show that the general price level is rising instead of declining.

"It must be apparent that as the price level increases the economic pressure upon the gold-mining industry will correspondingly increase. The retail price level upon which the purchase of mining materials would be more accurately based has not yet descended proportionately to the level of wholesale prices. No change in the price level has yet taken place which would enable the profitable operation of those gold mines which have discontinued operations during this period of economic stress. In fact, the normal condition of the industry cannot be restored unless the purchasing power of the 1913 dollar is restored. I fully appreciate that over a period of many years there may be a remote possibility that the purchasing power of the 1913 dollar will have returned, but I cannot conceive the possibility that the purchasing power of the dollar, in terms of material and labor utilized in the gold-mining industry, will return in time to save the ore reserves from loss through caving in the mines which have been shut down and filled with water during the period of 1916 to 1921.

"It must also be apparent that we cannot hope to maintain normal production of gold in the United States, which for the decade prior to 1916 annually averaged $95,000,000, unless the purchasing power of the 1913 dollar is re-established. The object therefore in suggesting that the loss in the purchasing power of the gold ounce be temporarily compensated is to conserve the investment which has been made in the gold-mining industry prior to 1916 from wastage and loss, and thus to conserve the gold-producing power of the nation. The improvement which you indicate has already taken place cannot refer to increased activities in any but those few properties which have under very great difficulties and expense to their ore reserves maintained operations over this critical period.

"You state that 'the monetary gold stock of the world has also increased during the past ten years it has been estimated by as much as $2,000,000,000.' With the enormous increase in the paper currency of the world, the marked decline in gold production, and the increased gold consumption in the industrial arts, the ratio of gold to notes has declined from 66 per cent in 1914 to less than 10 per cent in 1920. The paper currency of the world is now eleven times as much as at the beginning of the war, and the available supply of gold from sources of new production bears an increasingly diminishing ratio to the note circulation. The gold holdings and paper currencies of the fifty principal countries for which figures are available show that the ratio of gold to notes was 66.8 per cent in 1914, 17.9 per cent in 1918, 13.7 per cent in 1919, and 9.3 per cent in 1920.

"During this same period, in addition to these extensive note issues, world national debts expanded from $43,000,000,000 at the beginning of the war to $212,000,000,000 at its close, and advanced to about $256,000,000,000 at the end of the first year of peace, and at the end of the second year were approximately $300,000,000,000. The annual interest charges have advanced from $1,750,000,000 in 1913 to $12,000,000,000 in 1920. Both the principal of this debt and interest are payable in gold. It would appear from these facts that the increase of $2,000,000,000 in the world's gold stock, which you have cited, is a very meager addition as compared with the existing obligations arising from the need for currency redemption and the payments of debts and interest.

"The experience gained since the termination of the war indicates that at the earliest opportunity the people of every country will desire to return to their pre-war monetary customs. Those who have sustained losses through the purchase of paper notes which have since depreciated in value are aware that the use of this paper as an economy in the use of gold is a great fallacy. The preference which had developed for the use of paper notes will be replaced by a demand for the actual circulation of gold. The very fact that the banks are expected to discourage the use of gold as currency would seem to be in evidence that they are by no means confident that the people will not demand gold in circulation whenever reserves are released. The world stands bankrupt today for lack of gold.

"The net importation of gold into this country from 1914 to Sept. 20, 1921, has been $1,300,000,000. To this extraordinary extent we have depleted the monetary gold stocks of the countries of the world, which has been one of the fundamental causes for the depreciation of foreign currencies.

"To the depreciation in the European currencies in particular may be attributed the marked decline in our export trade. The present industrial depression in this country is largely due to the falling off in our export trade. The external purchasing power of all foreign countries of the world must be increased in order to restore normal conditions in our export trade. A redistribution of the gold which we have acquired since the beginning of the war is a prerequisite to increasing the external purchasing power of European countries and restoring financial poise to the balance of the world. Europe's need for part of our excessive supply of gold should not be forced to wait upon her ultimate recovery if we are to consider the dependence of our own nation's prosperity upon the restoration of export trade. As rapidly as one country after another approaches a more stable condition in its currency, an increased demand for gold will occur.

"Such a condition compels us to adopt a gold policy that will make possible a redistribution of the gold which we have acquired during and since the war as soon as conditions permit. Under such a policy we should not permit that gold to become the base of our credit and currency structure, as it could not then be released for export without forcing a rapid deflation. Under such a policy the United States should occupy the position of trustee for this newly acquired gold.

"The total reserve of the Federal Reserve Banks on Aug. 31, 1921, amounted

to $2,790,000,000. If these reserves were to be reduced by the $1,330,000,000 of gold acquired during the war and post-war period, the gold cover of the Federal Reserve notes in circulation on that date would be 34.8 per cent, which is considerably below the minimum of 40 per cent provided in the Federal Reserve Act, and considerably less than half the gold cover reported of 88.5 per cent. This statement indicates that some of this newly acquired gold is already a part of our credit and currency structure and could not be released without a still further contraction in the volume of our credit and currency. This does not indicate that under such a gold policy, we have an excessive amount of gold to accomplish the work which it will be called upon to perform which will be both national and international in character.

"There is a still more important consideration in a gold policy to redistribute this newly acquired gold than that which relates to the revival of our export trade. There is no question that the unstable condition of the foreign exchanges and their depreciation seriously menaces the maintenance of the gold standard. If the influx of gold continues at the present rate, and you state that there are no indications that the influx may end, it will not be long before the United States holds the gold stock of the world. It must be apparent that if foreign exchanges continue to depreciate, with a continued loss of this gold to us, that the increased disparities from the gold standard par would still more seriously jeopardize the security of gold as the international monetary unit and the medium of exchange. It would not seem possible for one nation to maintain a monetary unit as a medium of exchange when that unit could not be utilized in the trade transactions of the balance of the world.

"This gold was purchased by us with very cheap dollars and it will have to be repurchased by these foreign countries with much more expensive dollars in terms of labor and there will naturally arise a great resistance to a monetary system which thus imposes such a great burden upon the peoples of so many countries. Our problem, therefore, is to assist these nations in every way possible to recover their former gold stocks and thus enable them to appreciate their currencies to the gold standard level. If we fail to render them assistance, some other unit will be adopted as a matter not only of convenience but of necessity. As a creditor nation, we have become still more involved in the world's financial structure, and our continued position as such is dependent upon the maintenance of the gold standard.

"From the report of the Director of the Mint which you have submitted, the 'new gold' which was sold by the Treasury Department through the Mint Service to the industrial consumers, principally for the manufacture of jewelry, amounted for the years 1914 to 1919 inclusive, to $232,000,000. The National City Company estimates that the amount of 'new gold' sold by the Mint Service for consumption in the arts in 1920 amounted to $60,000,000. This makes a grand total of $292,000,000 of 'new gold' which was diverted from the monetary reserve for the manufacture of gold articles largely to satisfy the demand for luxuries. This statement excludes the 'old material' in accordance with the differentiation made in your letter, which reduces considerably the total amount of gold consumed in the manufactures and the arts.

"It is interesting to note that during the calendar year 1919 the United States exported an excess of gold over its imports in the amount of $291,600,000. Had this 'new gold' not been withdrawn from the monetary reserve for industrial consumption it would have been sufficient to more than replace the amount of gold lost by excess exportation in 1919, and would have removed, to a large extent, the need for putting into effect the drastic measures of deflation which were adopted by the Federal Reserve Board as a last resort to preserve the gold reserve ratio from declining below the legal minimum prescribed in the Federal Reserve Act. Had this gold been conserved for monetary uses instead of dissipated in satisfying the demands for luxury, the industries of the country would not have become paralyzed by a deflation so rapid and extensive as the one which was imposed.

"In the testimony of Governor Benjamin Strong of the Federal Reserve Bank of New York before the Joint Agricultural Commission of the Senate and House of Representatives he stated that $100,000 in gold in the bank reserves of the Federal Reserve System was equivalent to about $1,800,000 in terms of credit in the country banks of the nation. The $292,000,000 of 'new gold' which was withdrawn from the monetary reserve for industrial consumption during and since the war would have been equivalent to an extension of credit to the country banks of $5,250,000,000. Had this gold been available in September, 1920, a less restrictive policy of deflation could have been adopted with safety, which would not have imposed the burden that the agricultural and other industries of our nation have been forced to bear.

"I am firmly convinced that if our gold reserve had been protected against this extraordinarily heavy industrial drain and a moderate deflation begun within a year after the Armistice, our present difficulties of depression would not only have been minimized but might never have occurred.

"The decline in our governmental revenue receipts is due largely to the falling off in export trade, and yet the gold policy enunciated in your letter and which has been in effect both during and since the war has intensified the difficulties with which the Treasury Department is now confronted.

"While the effect of the lessened gold production over this period has been minimized by the jewelers in their testimony before the Committee on Ways and Means of the House of Representatives in their desire to guard their interests from the payment of this infinitesimal tax, an additional credit of $2,000,000,000 could have been extended to our country banks, making a total credit which might have been extended by a more conservative gold policy of $7,250,000,000. This amount of credit was eliminated through the wasteful practices of our war and post-war periods. The consequences of this policy have not yet ceased to exist.

"Congress, realizing the importance of immediate action in controlling the sales of gold to the trades, whenever the protection of our monetary system demands, enacted the law of March 3, 1901, which not only delegates to the Secretary of the Treasury the authority to control these sales but makes it mandatory that sales shall not be made without his consent.

"In your communication you refer to the fact that the market for gold is international. There could, therefore, have been no embarrassment to the industrial consumers of gold if they had been forced to purchase their gold in the world's market instead of having been allowed to remove it directly from the monetary reserve which serves as the basis of our credit and currency.

"It is important to notice that when the gold reserve ratio of the Federal Reserve System was lowest, interest rates became high and progressed to still higher levels when the policy of the Federal Reserve System to arbitrarily restrict the further extension of credit was put into effect. As soon as the stimulating effect of the additions of newly imported gold to the reserves of the system took place, interest rates become more moderate and the credit tension was considerably lessened, showing what a far-reaching influence under the present banking system of the nation a small amount of gold exerts over the vital instrument of credit.

"The benefits of this newly imported gold were immediately reflected in our domestic financial system, but this was accomplished at the expense of curtailing our export trade by reducing the purchasing power of Europe. The same benefits from a like amount of domestically produced gold in the banking system would have resulted without causing this decline in our export trade. The gold which has been diverted from the gold reserve to the manufacture of luxuries, had it been retained in the banking system, would have had a similarly beneficial effect without depressing our export trade.

"I note your statement that 'it is difficult in these circumstances to see what special equity there is in your claim for a premium when costs are high.'

"The equity lies in the fact that in the case of the gold mining industry the die was cast, the investment was made, and the loss of this investment occasioned by the shutting down of the mines was forced upon the industry because of the lack of governmental foresight in promptly providing a means for compensating the loss in purchasing power of the gold ounce, in accordance with the index number. Whereas, the investment in the jewelry industry would not have been impaired in the least by the payment of the excise imposed upon the manufacture of gold articles which could have been readily passed on to the consumer, as provided for in the legislation upon which your opinion has been asked.

"The enactment of this legislation will protect the public by insuring the quality of the article sold and would enable the public also to appraise the cost of the workmanship as well as the cost of the raw material. The provisions of the McFadden Bill which were referred to in the resolution impose no penalty on the purchase of foreign gold in this market to be used for non-monetary purposes, as the industrial consumers would continue to purchase their gold from the United States Mint at the free gold market price. For this reason a speculative market for gold could not develop.

"Furthermore, the cost of the premium provided in this legislation would not have fallen on the general public as a tax burden but would have been borne directly by the consumers of luxuries who have, it is presumed, the ability to pay.

"On the other hand, the government sold during this entire period of high prices $292,000,000 of 'new gold' to the industrial consumers at the pre-war price. In effect, is this not subsidizing the jewelers and other industrial consumers?

"The objection to employing artificial means to compensate for the lost purchasing power of the gold producers' dollar is answered by recalling that any price fixed by the government is artificial in character.

"I note particularly the paragraph in your letter which begins: 'The tax which the bill would impose upon the use of gold for non-monetary purposes, while in form a tax, would in fact put restrictions upon the free convertibility of the currency into gold. If gold could not be used except under heavy penalties, for anything else than money, its value would be impaired and there would be, in effect, a clog on the convertibility of the currency. One dollar in paper currency, in other words, would not buy one dollar's worth of gold if the gold was to be used in the arts.'

"It is difficult for me to understand how such a conclusion could be drawn when the provisions of the bill expressly state that the tax proposed is to be collected only at the time of the sale of the finished product. This tax is, therefore, not imposed upon the bullion to be sold by the mint to the industrial consumers of gold. Under the provisions of this bill the industrial consumers continue to obtain gold from the mint at the monetary price which now prevails. There is no relation now between the sale price of a manufactured article containing gold to the cost of raw material contained therein. Why, therefore, should the addition of this tax, which would be a small fraction of the sale price of the gold article, affect the free flow of gold or its convertibility?

"In France, since 1873, a special excise has been imposed upon the sale of manufactured articles containing gold. No disturbance to the free flow of gold or to the French monetary system has ever resulted. This tax in June, 1920, was greatly increased. No difficulty has been experienced in France in collecting this tax, and there should be no difficulty in collecting the tax here, as it can be readily measured by the amount of gold contained.

"Normally $250,000,000 of the world's total gold production was available for monetary purposes, but during 1919-20 there was less than $60,000,000 per annum available for monetary purposes, the balance having been absorbed by the industrial arts, India and China.

"The production of gold throughout the world is declining, and unrestricted industrial consumption for years to come would be so large as to reduce the amount available for monetary purposes. This condition must be remedied if the gold standard is to survive this period of readjustment. The industrial gold consumption of the world should, therefore, be forciby curtailed and gold production stimulated. Both of these conditions should be satisfied by an equitable adjustment in the cost and price equation between the producer of new gold and the industrial consumer. The McFadden Bill provides for such an adjustment.

"This constructive gold policy put into effect at this time will safeguard the maintenance of the gold standard. Such a policy is also prerequisite to a more rapid revival of our domestic industry and export trade upon which the full time employment of our people and the prosperity of the nation depends.

"In view of the great importance of this subject at the present time and because of its vital, far-reaching effects upon all the activities of our national life, I shall await with much interest your answer to this letter."

NEWS BY MINING DISTRICTS

London Letter

Attempted Deal of Russo-Asiatic With Soviet Government Fails—Rio Tinto Passes Dividend

BY W. A. DOMAN

London, Oct. 12—Leslie Urquhart has failed in his negotiations with the Soviet government at Moscow for the return of the properties of the Russo-Asiatic Consolidated to the shareholders. Conditions are impossible. Russia is dominated by communists, who recognize no obligations between individuals, and therefore no contracts between persons can be enforced. "The only obligation recognized and enforced in the communistic state is the absolute subjection of every individual to the state." Mr. Urquhart embodies his views in a circular letter to the shareholders, which covers a lengthy communication to Mr. Krassin. These documents are a telling exposition of the follies and failure of communism.

Conditions were imposed by the Soviet authorities of such a character that the Russo-Asiatic directors prefer to drop negotiations and remain claimants upon the government for damage for unlawful appropriation of properties and working capital. A perusal of the letter proves the impossibility of negotiating, and incidentally affords a good insight into the methods of the Third Internationale, the secret police and other official communist bodies. Had Mr. Urquhart succeeded—and he asked for nothing but bare justice for shareholders and workmen—funds might have been forthcoming for the development of other Russian enterprises. As it is, that unfortunate country is now ruled out.

I understand that Hugh F. Marriott is soon to proceed to South Africa to inquire into mining conditions there. It is an open secret that the heads of the big Kaffir finance corporations in London have for a considerable time been dissatisfied or disappointed at the state of affairs on the mines. Some seem to think that substantial economies could be effected, and the view is sometimes expressed that things run too much in a groove and should be altered. Sir Lionel Phillips is already in Johannesburg, so that it would appear that a thorough investigation is to be undertaken.

In London, Rio Tinto shares are regarded only as a speculation; in Paris, on the other hand, they are held as an investment. Holders had an unpleasant shock the other day when the directors announced that no interim dividend would be paid on the ordinary shares. In one sense the position of the company has improved, but taxation has increased to such an extent that the directors prefer to husband the resources of the company.

Although the shareholders of the Champion Reef Gold Mining Co., of India, agreed to the reconstruction scheme, it was fairly evident that some of them were not quite satisfied, and regarded an assessment of 1/6 on a half-crown share as decidedly heavy. The Champion Reef mine has done well in the past, but present shareholders cannot profit from past operations. A sum of £150,000 is required—£90,000 of it for further development. Hitherto the mine has depended upon one lode; there now seems to be a possibility of parallel lodes. As mining is carried on at greater depths expenses are not likely to be reduced. John Taylor & Sons, who are identified with gold mining on the Kolar field, nevertheless unhesitatingly recommend further exploitation and development, their views being to some extent based upon actual happenings in the adjoining Ooregum mine at similar depths.

During 1920 the Compagnie Aramayo de Mines en Bolivie, formerly the Aramayo Francke Mines, produced 2,011 tons of black tin, compared with 2,236 tons in 1919. It did not pay to produce wolfram, and the output of bismuth was reduced. The production of silver was on a larger scale—973,038 oz., against 701,554 oz. During the first six months of the current year the production of tin and bismuth has been reduced, but the silver output has gone up about 15 per cent.

BURMA

Bawdwin — The Burma Corporation reports that the lead production at the Bawdwin Mines in September was 3,876 tons gross, refined lead production 2,534 tons, refined silver production approximately 294,102 oz., and base bullion produced but not refined during the month 430 tons, containing approximately 41,000 oz. of silver.

CANADA

British Columbia

Floods Reported To Have Caused Damage in Salmon River and Alice Arm Districts

Prince Rupert — Floods, following heavy rains, are reported to have done some damage in the Salmon River and Alice Arm mining districts. Several bridges on the Alice Arm-Dolly Varden Railway have been undermined. The railway had just been reopened, after being idle since last December. Bridges over the Salmon and Bear Rivers are reported to have been washed away, and the town of Hyder, the United States entry port to the Salmon River district, is partly under water. It is feared that the floods may have done considerable damage to the eleven and one-half mile aërial tramway that is being constructed between the Premier mine and tidewater.

Quesnel—There is some excitement in the old Cariboo. Gold has again been struck. How important the discovery is cannot be said until more reliable information is received, but first reports are favorable and have started a stampede from the Horsefly and Quesnel Forks districts. The find is said to have been made at Cedar Creek, on Quesnel Lake, about eight miles up the lake from Quesnel Dam.

Smithers—The summer program of development at the Cronin mine has been completed and the property closed down for the winter.

Rossland — R. B. Shelledey and associates, lessees of the I. X. L. mine, have been stoping gold ore, which has in some instances run over $100 per ton. The property is owned by John S. Baker, president of the Fidelity Trust Co., Tacoma, and following the breaking of the Rossland mining boom, the ground was inactive for a number of years.

Trail—Ore shipments received at the Consolidated smelter Oct. 8 to 14 totaled 3,185 tons, coming from the following shippers:

Mine	Locality	Gross Tons
Josie	Rossland, B. C.	98
Republic	Republic, Wash.	36
Whitewater	Retallack, B. C.	33
Company mines		3,018

Ontario

T. & N. O. Ry. Gets Control of New Source of Water Power Near Big Bend

Porcupine — Last spring the Hollinger tried to get control of a water-power source near Big Bend, down the Abitibi River, but permission was refused by the government. It is now understood that the control of this power has been obtained by the T. & N. O. Railway Commission, and that the commission has a proposal before it to develop the power and sell to the public consumer. It is estimated that a total of 30,000 hp. can be developed, and if this were brought into Porcupine, the serious power question in that camp would be solved. The future growth of the district appears to depend upon new sources of power being developed. Without it the present companies cannot increase their capacity, with any degree of security, and no new companies desirous of starting up can contract for a supply of hydro-electric energy.

The Hollinger is now treating 3,700 to 3,800 tons a day, and on certain days when conditions are exceptionally favorable as much as 4,000 tons has been put through in twenty-four hours.

Cobalt—The Nipissing report shows that for September the company mined ore of an estimated value of $197,536 and shipped Nipissing and customs ore of an estimated net value of $164,405. The new vein found in August from 63 shaft has been drifted on for 80 ft., of which 60 ft. shows 3 in. of 2,500 oz. ore. A few small veins of minor importance were also found at Shaft 73. The low-grade mill treated 6,833 tons and the high-grade plant treated only thirty-six tons, being shut down awaiting the completion of the acid-treatment annex.

The Victory property, near the Temiskaming, will sink from the 200 level to 500 ft. A large cobalt vein with low silver values was drifted on at the 200 level, and it is hoped that this vein will improve as depth is gained.

The annual report of the Kerr Lake states that though no important discoveries were made the last year, the results of the exploration campaign were encouraging. It is believed that the diabase-Keewatin contact will warrant much more exploration, and that the chances of finding large and profitable orebodies are good. It is of considerable interest to note that on the 550 level gold assays showed from $1.20 to $28.

The Keeley mine, in South Lorraine, with a long and rather unenviable history, appears at last to have come into its own. This property was the earliest important discovery in South Lorraine, and was financed by funds borrowed from the Farmers' Bank. The property proved to be a failure, with the result that the bank was wrecked and the general manager sent to the penitentiary. A few years ago the property was taken over by the Associated Goldfields of Western Australia, and has been worked in a desultory manner, with indifferent results. A year or more ago a small mill was erected. Recently an important high-grade vein was found, and since June the property has shipped over 200,000 oz., with the prospect that heavy shipments will be made in the future.

Kirkland Lake — The new shaft of the Comfort-Kirkland has reached a depth of 125 ft., and at the 150 level a station will be cut and crosscutting started.

MEXICO

Federal District

October Silver Output Not Expected To Show Increase

Mexico City—Information given out by the Secretary of Industry and Commerce shows a slight increase in the production of gold and silver in Mexico during July and August. The official report for September is not completed. The amount of silver produced in July of this year was 161,989 kg., and in August 162,538 kg. Gold in July totaled 1,640 kg., and for August 1,923 kg.

Regardless of the advance in the price of silver, it is probable that the production in October will not exceed that of the preceding months. A larger quantity of ore may be shipped and treated but the price of silver will admit handling much low-grade material that has been left in the mine or on the dumps. More laborers will be employed at both the mines and smelters, and it is probable that a great many of the idle low-grade mines will resume operations.

Zacatecas

La Plomoso Smelter Resumes

Mazapil—After a prolonged shutdown, La Plomoso smelter, at Mazapil, has resumed operations. This plant belongs to the Mazapil Copper Co. The blowing in of the smelter has given employment to about 800 men and has caused considerable renewed activity in the camp.

Durango

Rumored Asarco Smelter and Velardeña Mines May Resume Operations Soon

Durango—The Peñoles company is moving its smelter from Mapimi, Dgo., to Torreon, Coah., and by thus enlarging the Torreon plant it is said that it will become one of the largest in Mexico. Should the construction work continue as planned, the report is that operations may be expected by Jan. 1.

There has been no official announcement from the American Smelting & Refining Co. regarding the near opening of the Asarco smelter and the mines at Velardeña which supply the tonnage for their plant, but rumors are insistent that the plant will be in operation within another month. Its operation is always looked upon as an indication of increased activity in the smaller mines, as a much shorter freight haul is an attractive feature with those who hesitate. The rainy season in this country has passed, and with the increase in silver prices it is expected that the mining industry will pick up materially, and many small companies will resume operations.

The Promontorio company continues small but regular shipments of about three cars per month. The Topia and Guanacevi districts are doing nothing, but now that the rainy season is over they should soon be in operation again. The Chalchihuites and Sombrerete districts are sending fair shipments to the Aguescalientes smelter.

ARIZONA

All Shovels Stopped on Sacramento Hill Work—United Verde To Start on New Crushing Plant

Bisbee—Steam-shovel operations on the Sacramento Hill division of the Copper Queen property at Bisbee were suspended indefinitely Oct. 21. The force was thus reduced by 150 men.

Jerome—Following a visit to Jerome of Charles W. Clark, general manager of the United Verde Copper Co., announcement has been made locally that work is to be started immediately on the new crushing plant which is expected to take two years to complete and to cost $1,000,000. There is to be provision of much more storage capacity than now is available. The necessary grading will be done by the steam shovels that have been taken from the upper level, back of the old slag dump. About 200 men are employed at the smelter, which is declared to be in condition for work, and 275 are engaged underground.

Phoenix—The Marquis de Gerin, of Paris, is representing in Arizona the interests of French and Belgian stockholders in the Swansea mines, with especial reference to the question whether the ten-year lease on the property held by the bankrupt Consolidated Arizona Smelting Co. shall be extended to the reorganized corporation, the Southwest Metals Co.

Application again has been made to the Arizona Corporation Commission for permission to dismantle the Arizona-Swansea railroad, which connects Bouse, on the Arizona-California railroad, with the mining camp of Swansea, 21 miles distant. The road is owned by the Mitchell interests of Los Angeles. It is claimed that no revenue has been had from the property in two years. Its main traffic was from operation of the Swansea mine, under bond to the Consolidated Arizona Smelting Co. of Humboldt, a corporation now undergoing reorganization. Ores and concentrates were shipped to the Humboldt plant to the extent of about 200 tons daily.

NEW MEXICO

C. & A. Co.'s 85 Mine Only Copper Property Operating in State—Silver-Lead Properties in Demand

BY JAMES P. PORTEUS

Mining conditions throughout New Mexico remain quiet, though skeleton organizations at the big copper properties are being maintained. There is a hopeful optimism in evidence that copper properties will become more active in the next six months. Considerable interest is shown by mining "scouts" in silver-lead prospects. A group of ten claims of this type on Bitter Creek, in the Steeple Rock district, was recently taken over by the Calumet & Arizona Mining Co., and an option has just been closed on the Waterloo property in the Tres Hermanas district. Another big block of claims surrounding this property is under negotiation, as are several properties near Lordsburg.

At Steins Pass a number of claims have been grouped with the old Volcano mine, and an effort is being made to float a company by the sale of stock. The territory between Silver City and Mogollon has been getting attention from prospectors, with the result that properties on both Rain and Dry creeks are working about thirty men and are showing some high-grade silver ores.

Chloride Flat, near Silver City, is working about seventy-five men on leases in the old workings in the properties of the Amory Stevens estate and the Bohemian Mining Co. About ten carloads of ore has been going weekly to the El Paso smelter, which on account of its good fluxing qualities has been accorded a treatment charge that allows the shipping of low-grade ores from old dumps and fills.

The Co-operative mine, at Lordsburg, has been making a good showing, shipping about three carloads of silver-lead per month that averages over 100 oz. silver per ton, and the Last Chance mine is working with an increased force. The management is installing a 175-hp. water tube boiler and a 90-hp. Corliss engine in the new power house. An estimate of the ore reserves has been completed, showing 30,000 tons of silver ores that will average 12 oz. blocked out since John H. White took over the property last April.

The 85 mine of the C. & A. Mining Co., at Lordsburg, is the only copper mine working in the state. Its monthly shipments for the year have averaged about 1,250 tons of siliceous ores, gained solely from development work. These have been going into stockpiles at Douglas, Ariz. Development work is being pushed and a depth of 1,327 ft. in the main shaft has been reached. The orebody on the 1,050 level has been opened for about 1,500 ft.

The Hanover-Fierro district is quiet, only twenty men being reported as working.

The only operation in the Mogollon district is the Mogollon Mines Co., which continues to turn out a restricted tonnage of gold ores.

A moderate demand for fluorspar continues, and shipments of both ground and lump material are moving from Las Cruces and vicinity. The Great Eagle mine, near Lordsburg, has begun hauling 90 per cent grade ores on contracts made in Chicago territory.

COLORADO

Alma Camp More Active Than in Fifteen Years

Alma—The resumption of mining activity in the Alma district still continues, and the last month has shown a decided improvement, both as to the number of men employed and the amount of ore being opened up and extracted. There is more real and permanent activity in the camp at present than there has been in the last fifteen years.

The London Co. has completed the preliminary work necessary to start the air compressor. A new hydro-electric plant has been installed, using the flow of water from the new tunnel. The work of extending the lower tunnel a distance of 2,500 ft. is progressing well.

The lessees on the South London are producing about 100 tons monthly of a siliceous lead ore carrying about 8 oz. gold and 6 oz. silver.

Engineers are engaged in a complete examination of the North London mine, mill and tramway. The mill and tram are to be rebuilt and modernized, and a new plant is to be installed at the mine.

The Gold Wave property on Mount Loveland has been leased to Leadville people, who have opened up a streak of 8-oz. gold ore, a shipment of which will be made soon.

A Nebraska company has taken a lease and bond on the old Sultana group of claims on Mount Loveland and has a force of men opening up and retimbering the old workings. The management plans to start mining operations in the early spring and the construction of a concentration plant during the summer.

The orebody recently opened at the Dolly Varden, on Mount Bross, is surpassing expectations. It is about 2 ft. thick, has been developed for about 30 ft. in length, and is assaying from 100 to 1,000 oz. silver per ton. The property is being operated by the Louisiana & Colorado Mining Co.

The Calumet & Hecla property on Mount Lincoln is to be thoroughly exploited this winter, contracts having been let for driving the crosscut tunnels to open the orebodies lying adjacent to the two porphyry dikes which cross the claims.

The Yuba Construction Co. is rushing the work on the 9-ft. dredge being installed on the Platte River near Fairplay for the Platte River Dredging Co. The company expects to have the boat under cover within thirty days at the latest.

The Hoil property on Mount Bross is to resume operations at once.

High-grade gold ore was discovered on the Hard To Beat claim, in the North Mosquito district, early in September, but the find was kept secret until more development could be done. The ore streak is about 18 in. wide, occurring on a bedding plane between two quartzites, and is a honeycomb quartz carrying from 10 to 100 oz. gold and from 5 to 10 oz. silver per ton. An average sample from the outcrop gave gold 59.90 oz. and silver 10.40 oz. The lessees have about ten tons ready to ship.

The Mount Lincoln Consolidation Co. has established three camps between Alma and the Russia mine, and is rebuilding the old Mount Lincoln wagon road. A large force is employed in an effort to get this road completed and the new electric air compressor on the ground and installed before snow falls.

The Colorado Power Co. has moved its camp to the Russia mine, and is crowding the work of installing the new line from Quartzville to the Russia, in an effort to get the same completed before the bad weather sets in.

Cripple Creek—Forty-two sets of lessees are operating in the Ajax property between the surface and the 18th level. The output of the mine is about sixty tons daily. The ore averages about $10 a ton. The product is shipped to the Golden Cycle plant at Colorado Springs for treatment. The Ajax dump, estimated to contain more than 200,000 tons of material that will assay about $8 a ton, has been leased to Fred Jones, who will make trial shipments to the Portland mill.

Shaft No. 2 of the Portland Gold Mining Co. is being sunk from the 2,450 level, and will probably reach the 2,600 level by the end of October. A drift will be advanced on the new bottom level to open the rich ore shoot disclosed on the level above. The concrete foundation is being laid for the new hoist at Shaft No. 2. Several sets of lessees in the Portland mine are shipping to the Independence mill.

Prospecting by diamond drill is progressing at the Cresson mine, and some encouraging results are being obtained in heretofore undeveloped territory.

UTAH

Tintic Standard's Shipments Increase —Silver King Coalition Opens New Ore

Eureka—Shipments of ore from the Tintic district for the week ended Oct. 15 amounted to 142 cars. Shippers were: Tintic Standard, 61 cars; Chief Consolidated, 33; Iron King, 10; Eagle & Blue Bell, 8; Iron Blossom, 7; Victoria, 4; Swansea, 4; Centennial Eureka, 3; Colorado, 2; Bullion Beck, 1; Eureka Mines, 1; Alaska, 1; Sunbeam, 1.

The Tintic Standard has had some trouble with its transformer during the week. The rise in the price of lead is reflected in the larger shipments from this property, which shipped sixty-one cars the week ended Oct. 15. Underground conditions are such that this rate will probably continue.

Park City—At the Silver King Coalition new ore has been opened on the 1,450 level, 600 ft. farther to the southwest than other ore encountered on this level. This gives a large stoping area. The ore is high-grade silver lead.

Salt Lake City—The first shipment from the recent strike at the Alta Tunnel & Transportation in Big Cottonwood Canyon ran $57.15 per ton, and a car of forty-three tons netted the company about $2,000.

IDAHO

Talache—The Armstead mines will start its mill on Jan. 1. The mill structure has been completed, and machinery is arriving. Work in the mine is being advanced as rapidly as possible.

Featherville—About 75 men are employed on dredge construction work here for the first large dredge being put in by the Hammon Dredging Co.

Hope—Much outside work is being done this fall at Auxer Gold property, in preparation for a steady winter's development. A small compressor was recently installed at the property.

MONTANA

Anaconda May Open Part of Washoe Smelter To Handle Silver Ores—Barnes-King Leases Gold Prospect Near Waterloo

Butte—The Anaconda Copper Mining Co. is unofficially reported to have under consideration the reopening of a section of its Washoe smelter for the treatment of silver ore from lessees and probably one or two of its silver properties, such as the Emma, which has been kept clear of water and is ready to resume.

The company has applied for a patent, in connection with its new shingle product, on a connecting device which joints the shingles so closely that a hose playing on a copper-zinc roofing fails to disclose leakage. This device also serves to conceal the nails. Anaconda will construct a sheet mill at Great Falls, according to those believed to be informed. This mill is also to be used for the rolling of shingles. The company, it is said, is planning a number of improvements at its Great Falls zinc plant, which will be made when metal conditions are more normal.

The Barnes-King Development Co. has secured control of a gold prospect near Waterloo, Mont., under a bond and lease for $150,000, which it is believed carries much promise as judged from the gold values in evidence at the surface. Thus far only a trench has been run, opening the vein, this trench disclosing attractive ore. Until a road is constructed to the claim, no development will be undertaken, as the country is very rough. Drilling of the Kansas-Montana well, in the Winnifred field, near Lewiston, Mont., will be resumed. The Barnes-King is interested in this well.

Butte & Superior has started crosscutting on the 2,600 level for the copper vein uncovered on the 2,000 and the 2,200 levels of the Black Rock mine. The persistency of the copper showing on both the levels where this vein has been cut has encouraged the belief that it will be found to be similar at greater depth.

North Butte is encouraged with the ore showing disclosed on the 3,600 level of the Edith May vein, according to what is regarded as dependable information. Robert Linton, president of the company, inspected the North Butte properties recently, consulting with the local officials.

Troy—Official word is had of the opening of a body of lead-silver ore in the Montana-Morning company's property. It is described by the superintendent as large and of high grade.

Elkhorn—Completion of the power line from the Big Hole station of the Montana Power Co. to the Elkhorn concentrator of the Boston & Montana Development Co., together with some interior wiring, is all that is holding up milling operations.

Cooke City—Five companies are pushing development work in the Cooke City district, and a further increase of activity is expected.

NEVADA

Silver Hills Nevada Unsuccessful in Finding Commercial Ore

Reno—A letter to stockholders of the Silver Hills Nevada Mines Co., which operates a property at Tule Canyon, Esmeralda County, Nev., frankly states that efforts to find a body of commercial ore have been unsuccessful, and the recommendation is made that the company seek to discover and acquire a new property. A report by F. C. Merritt is also published in the circular letter, giving in detail the result of his examination of the property. Mr. Merritt says: "The work done so far seems to prove that the orebodies cannot be expected to extend downward to any appreciable depth. They are co-existent only with the zone of altered granite, bottoming in the fresh unaltered material. This zone of altered granite extends for about 6,000 ft. and varies from 20 to 150 ft. wide. Throughout this zone, scattered irregularly, orebodies of varying size and value, some of them very rich, have been extracted. Much of this zone is still unprospected, and I have no doubt that many lenses of ore remain undiscovered; but in the eighteen months of operation it has been proved that the value of the ore extracted does not recompense the company for the expense necessary to find and extract it, and I recommend that further prospecting be abandoned."

Divide—The Tonopah Divide and Divide Extension companies report regular production and development, with no new discoveries of importance. At the Brougher Divide development is being done on the 175 and 505 levels. Ore of milling grade is being blocked out, and conditions are said to be good.

Silver Peak.—The management of the Western Chemical Co. has announced that the final payment on the anhydrous sodium sulphate deposit near Clarkdale, Ariz., has been made. At the Silver Peak property two leaching tanks are now in use, and the mill is treating thirty tons of potash-alum ore daily. The present grade of ore yields a saving of 20 per cent alum and 15 per cent sulphur. It is expected that tonnage will soon be increased to ninety tons per day. It is reported that a five-year contract has been entered into for the purchase of the entire product, consisting of potash-alum, flowers of sulphur, and sodium sulphate. The report should be welcome news to stockholders of the Western Chemical Co., which has had many difficulties, both financial and mechanical, and within the last year many optimistic reports of future operations have been issued which later proved to be premature and unfounded on fact. This is the first report issued of actual, and not prophetic, operations.

The Mary mine, at one time the principal gold producer of the Silver Peak district, has been leased, and subleases are being granted. There was at one time a sixty-stamp mill on the property, but this has been torn down, and only ten stamps remain. Recovery is by the amalgamation and cyanidation processes.

MICHIGAN

The Copper Country

Arcadian Drift Remains in Good Ground—Rail Strike Not To Affect Roads Serving Mines—Mohawk Sues Government — State Tax Rate Reduced

BY M. W. YOUNGS

Houghton — Arcadian continues in good copper-bearing ground in its drift, which is proceeding south from the 942 level of the New Baltic shaft toward the 900 level drift of the New Arcadian shaft at the rate of about 180 ft. per month. The vein varies from 5 to 20 ft., averaging 12 ft. of milling rock. The drift, now close to 700 ft. long, has encountered three minor faults, the vein being picked up each time after crosscutting only a short distance. The drift has approximately 1,800 ft. to go before it establishes contact with the north drift, 1,000 ft. long, from the 900 level of the New Arcadian. The work will be pushed as rapidly as possible throughout the winter.

Gratiot No. 2 shaft is being kept dry down to the 13th or bottom level in preparation for a resumption of sinking, which will be started as soon as a new hoist is installed. Gratiot values have been proved from the 13th level up to the 11th, and as Seneca continues in commercial ground at a considerably greater depth, it is assumed that the vein at the Gratiot end of the property will assay equally as well in copper content as the shaft is deepened. The extension of the Seneca drifts toward Gratiot indicate that the values in the intervening ground will be found uniformly good. The shafts are approximately 3,500 ft. apart and the proving and opening up of this vast territory is the object of the further sinking of the Gratiot and its connection, at a depth of 4,000 ft., with the Seneca's 3d level drift. It is believed the new Gratiot hoist will be delivered and installed within the next two months.

A railroad strike would not affect any of the railroads serving producing mines in this district and production would continue as usual. Quincy is served by its own railroad, and the Copper Range serves the Champion, Baltic, Trimountain, Mohawk, and Wolverine mines. Copper Range is not affected by the strike order, as it already has satisfactorily adjusted wages with its employees and the 12½c. reduction and the proposed additional 10 per cent reduction, which lies at the bottom of the present trouble, is applicable only to trunk line roads. Copper Range employees were never paid the trunk line scale.

The Mohawk Mining Co. has brought suit for $125,000 for the use of its fourteen miles of railroad between mine and mill during the period of Federal control and operation of the Copper Range railroad from June 25, 1918, to March 1, 1920. It holds this amount a fair and reasonable rental of its railroad facilities, having paid for rock haulage during that period more than $350,000. The suit has been filed in Houghton County and will be tried in circuit court here. It is brought against James C. Davis, agent of the Railroad Administration, under the provisions of the Transportation Act of 1920, authorizing suits against the Federal agent for causes of action arising during the period of control.

Prior to the outbreak of the war, Mohawk entered into a contract with Copper Range to serve its railroad needs, using the Mohawk tracks. When the Copper Range was taken over by the Railroad Administration, the new general rate order, greatly increasing rates on rock haulage, abrogated the contract existing between the Mohawk and the Copper Range.

A total of 4,793 men are employed in the mines of Houghton and Keweenaw counties, 3,910 in Houghton County and 883 in Keweenaw, according to the reports of the mine inspectors for the year ended Sept. 30.

The mining companies of the district, which pay the bulk of the taxes, will benefit by a greatly reduced state tax rate the coming year. The amount to be raised in Houghton County for state purposes will be $274,576.17, a decided drop from the present year's total of $383,867.96. The decrease is due to the fact that Houghton County's equalized valuation was reduced from its former total, whereas the figures for the state as a whole were increased.

Gogebic Range

Colby and Ironton Mines May Resume Soon—Decision Favoring N. Masse Reversed

Ironwood—Recent news from the steel districts seems to warrant optimism in regard to the ore business, but as yet the mines of this range have not increased their operations. However, it is probable that the Colby and Ironton mines will soon reopen with fair-sized forces and reduced wages, as the McKinney Steel Co. mines on other ranges are doing. The Townsite mine, though not operating for several months, has shipped practically all of its stockpiles, and should be able to operate through the winter.

At some of the Steel Corporation shafts shipping from stock has evidently ceased for the season, as new trestles have been erected and some ore is being dumped on the stockpiles. Damage suits for a total of $9,000 have been brought against this company for impairment of farm land alleged to have been caused by water from the mines.

The State Supreme Court has reversed the decision and ordered a new trial in the case of Houghton County vs. N. Masse, of Bessemer, over title to a valuable piece of mineral land, adjoining the Palms-Anvil-Keweenaw mine. The original decision in favor of Masse was too obviously inconsistent with the evidence submitted.

JOPLIN-MIAMI DISTRICT

Activity Increasing as Ore Prices Strengthen—Several Discoveries of Good Ore Reported

BY P. R. COLDREN

Joplin — Strengthening zinc ore prices, coupled with $60 for lead ore, have resulted in increased activity in the Tri-State zinc and lead field during the last few weeks. A number of the larger companies have increased their output by placing in operation mills that have been down for some months, among these being the Skelton Lead & Zinc Co., the Underwriters' Land Co., the Admiralty Zinc Co., the Commonwealth Co., and the Kanok Metal Co. Other companies that plan increased activity and production in the immediate future include the Lucky O. K. and Brewster, the Chanute Spelter, the Lucky Jew, and the Commerce Mining & Royalty.

Despite these instances of increased activity, prominent operators declare that increased production to anything like the peak attained in 1918 and 1919 is highly improbable, if not actually impossible. There is a shortage of efficient labor, for one thing, many of the best of the district's mining men having become discouraged during the last six months and moved to other fields or engaged in other work. In addition, there is the fact that the cream of the richest ores has been taken from many of the biggest mines in the field and there has been no development in recent months to discover new mines to take their places.

Though there are many tons of surplus ore in the field, it is in strong hands, and when the probability of only slightly increased production is taken into consideration, along with the fact of greatly curtailed production from the Western zinc-production mines, local producers seem to be justified in their belief that zinc ore prices are almost certain to show substantial advancement in the months ahead.

The Chanute Spelter Co., a subsidiary of the American Metal Co., has recently opened up a new field shaft and mine on a tract of land to the west of its Hartley mine, west of Baxter Springs, Kan. The new shaft is connected with the Hartley mill by a surface railroad, and development to date indicates it has tapped an extensive orebody. The Chanute company has not yet started up its new Brewster mill, on a tract about three-quarters of a mile to the northwest of the Hartley, but D. F. Haley, the manager, went to New York recently to talk over with the American Metal management the desirability of opening this mine at this time. The mill, which is virtually completed, is one of the best in the field.

Announcement of recent excellent strikes of lead ore on tracts in the old Webb City-Carterville field in Missouri has led to a demand for a custom mill in this district, and it is understood that one will be erected at once. The strikes have been made on the Connor land. on the Troup land, and on the Missouri Zinc Fields land.

THE MARKET REPORT

Daily Prices of Metals

Oct.	Copper, N. Y., net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
20	12.75	28.00	28.50	4.65@4.70	4.40@4.45	4.65
21	12.625@12.75	28.00	28.50	4.65@4.70	4.40	4.60@4.65
22	12.625@12.75	28.00	28.50	4.65@4.70	4.40	4.60
24	12.625@12.75	28.00	28.50	4.65@4.70	4.40	4.60
25	12.625@12.75	28.00	28.50	4.65@4 70	4.40	4.60
26	12.625@12.75	27.75	28.25	4.65@4.70	4.40	4.55@4.60

*These prices correspond to the following quotations for copper delivered: Oct. 20, 13c.; Oct. 21 to 26 inc., 12.875c.@13c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York, cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Tin is quoted on the basis of spot American tin, 99 per cent grade, and spot Straits tin.

London

Oct.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3 M		Spot	3 M	Spot	3 M	Spot	3 M
20	66¼	67½	73	157½	159⅝	23¾	23⅞	26⅜	26¾
21	66	67⅛	73	158¼	160½	24	23¾	26⅜	26¾
22	...	...	...	....	....	...	...	..	...
24	66⅛	67⅛	72½	158	160½	24⅛	23¾	26¼	26½
25	66	67	72½	156½	158¾	24⅛	23⅞	25⅞	26¼
26	65¼	66¼	72	155½	158	24⅛	23¾	25¾	26⅛

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver and Sterling Exchange

Oct.	Sterling Exchange "Checks"	Silver			Oct.	Sterling Exchange "Checks"	Silver		
		New York Domestic Origin	New York Foreign Origin	London			New York Domestic Origin	New York, Foreign Origin	London
20	393⅜	99¼	71½	40 7/16	24	392⅜	99¼	70⅛	40⅛
21	393¾	99¼	71½	40⅜	25	395¾	99¼	68⅝	39⅛
22	392½	99¼	70⅞	40¾	26	394¼	99¼	69⅜	39⅝

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon.

Metal Markets

New York, Oct. 26, 1921

Conditions have been generally quiet during the last week. This has been the result partly of the buying wave of some weeks ago, which it was expected would be followed by a reaction, and to some extent by uncertain transportation conditions. The railroad strike is still set for the first of November, but an increasing number of employees seem disposed to remain at their work, and no general tie-up of transportation is expected. However, consumers have preferred to await the outcome before contracting for their regular advance requirements. The demand, of course, is only deferred.

Copper

A fair business was done on Thursday and Friday, but since then the inquiry has been exceedingly slight. The larger producers are generally holding to the 13c. delivered price, although the tonnage sold at this figure has not been large, and has been mostly for December delivery. Some of the consumers have been anxious to obtain cut prices and have succeeded in doing so in certain quarters. In fact, yesterday there were rumors of sales as low as 12.75c. delivered for spot metal, but we have had no actual reports of sales at that price. The demand for prompt metal is virtually non-existent, and were one compelled to sell a small tonnage of spot metal he might not be able to obtain more than 12.75c. for it. It is generally felt that the present reaction is only temporary and that in a week or two weeks the price will again be firm, provided the railroad strike does not result seriously. Demand for copper is now well diversified. Wire drawers are the chief consumers, but this is a normal condition. Brass makers are gradually coming into the market as their stocks of scrap are exhausted; by the first of the year practically all stocks of scrap are expected to be cleaned up.

Export demand has also been quiet, a few sales having been made of from 100 to 500 tons to the usual destinations.

Lead

The official contract price of the American Smelting & Refining Co. continues at 4.70c. The outside market has fallen slightly under this level, however, producers being unable to secure more than 4.65 and 4.675c. for New York delivery. The decreased demand is probably only temporary, for manufacturers have not in general curtailed operations. In Chicago, business has been done all week at 4.50c. and in St. Louis the market has weakened to 4.40c. In fact, some business has been done at 4.375c., though other producers of favored brands have been able to secure 4.45c. Some lots which have been offered in the St. Louis district for some time have now been cleaned up, and there is but little metal pressing on the market. The London price has shown a stronger tendency, and fundamental conditions in the lead industry continue excellent. Demand for forward deliveries is only nominal. Corroding lead commands a premium of from 7½ to 10 points.

Zinc

The zinc market has weakened somewhat, owing to pressure to sell on the part of some of the smaller producers, who felt that the present price is very satisfactory compared with recent levels, and who did not care to take the chance of a depression during unsettled railroad conditions. Galvanizing interests, which have been the chief buyers recently, are well supplied for current requirements, and no great demand is expected for two or three weeks. Some brass special has been sold at the usual 10 points premium, but it has in general gone to galvanizers who wanted a better grade of zinc than usual, rather than to brass makers. High-grade remains at 6c. delivered in Eastern districts.

Tin

The New York price of tin has remained more constant than for some time, it so happening that fluctuations

in London have been offset by variations in sterling exchange. Manufacturers of tin plate continue to operate at about the same capacity as during recent weeks, but fundamental conditions are slowly improving among tin-producing interests. In addition to the curtailment of South American production, which has been mentioned before, Chinese tin is scarce and the Straits supplies seem to be more firmly held than ever. There is also a tendency to cut down the production in the Far East.

Tin for forward delivery: Oct. 20th, 28.75c.; 21st, 28.625c.; 22d, 28.625c.; 24th, 28.50c.; 25th, 28.625c.; and 26th, 28.625c.

Arrivals of tin, in long tons: Oct. 18th, Straits, 5.

Gold

Gold in London: Oct. 20th, 104s. 9d.; 21st, 104s.; 24th, 104s. 8d.; 25th, 104s. 4d.; 26th, 104s. 2d.

Foreign Exchange

The strength which has characterized sterling lately is unusual at this time of the year, when dollars are in demand for grain and cotton bills, and is no doubt caused by the fact that speculative trading in sterling has taken place to a greater extent than usual in recent months, in anticipation of a decline. Sterling cables continue to be quoted at one-half cent premium over demand. Continental exchanges have improved slightly. On Tuesday, Oct. 25th, francs were 7.29c.; lire, 3.93c.; and marks, 0.6125c. New York funds in Montreal are now at the lowest premium for some time, and the tendency continues downward. The quotation yesterday was 9 1/16 per cent premium.

Silver

The market has been quiet of late, the demand from all quarters being limited. Eastern exchange rates have declined, the fall being sharp on occasions, owing to speculative operations. China is buying, but only moderately.

Mexican Dollars—Oct. 20th, 55; 21st, 55; 22d, 54 1/2; 24th, 53 3/4; 25th, 52 3/8; 26th, 53 3/8.

Other Metals

Quotations cover wholesale lots unless otherwise specified.

Aluminum—List prices of 24.5@25c. are nominal. Outside market, 17.50@18c. with practically no sales.

Antimony—Chinese and Japanese brands, 4.90@5.25c.; W. C. C. brand, 5.25@5.75c. per lb. Cookson's "C" grade, spot, 9c. per lb. Chinese needle antimony, lump, nominal at 4c. per lb. Standard powdered needle antimony (200 mesh), nominal at 5.25c. per lb.

White antimony oxide, Chinese, guaranteed 99 per cent Sb_2O_3, wholesale lots, 6 1/2@7c.

Bismuth—$1.50@$1.55 per lb.

Cadmium—Range $1@$1.10 per lb., in 1,000-lb. lots. Smaller quantities, $1.10@$1.25 per lb.

Cobalt—Metal, $3@$3.25 per lb.; black oxide, $2@$2.10 per lb. in bbls.

Iridium—Nominal, $150@$170 per oz.

Molybdenum Metal—In rod or wire form, 99.9 per cent pure, $32@$40 per lb., according to gage.

Nickel—Standard market, ingot, 41c.; shot, 41c.; electrolytic, 44c. Small tonnages, spot, 35@38c. Market dead.

Monel Metal—Shot, 35c.; blocks, 35c., and ingots, 38c. per lb., f.o.b. Bayonne.

Osmium—$70 per troy oz. Nominal. $70, Los Angeles, Cal.

Palladium—Nominal, $55@$60 per oz.

Platinum—$82@$85 per oz.

Quicksilver—$39@$41 per flask. San Francisco wires $42. Market improving.

The prices of the following metals remain unchanged from the figures published in these columns on Oct. 15: Rhodium, Selenium, Thallium, and Tungsten.

Metallic Ores

The market is generally exceedingly quiet, and prices on the following ores remain unchanged from the figures published in the Market Report in the Oct. 15 issue: Chrome, Iron, Magnetite, Manganese, Molybdenum, Tantalum, Titanium, Tungsten, Uranium, Vanadium, Zircon, and Zirkite ores.

Zinc and Lead Ore Markets

Joplin, Mo., Oct. 22—Zinc blende, per ton, high, $26.30; basis 60 per cent zinc, premium, $25; Prime Western, $24; fines and slimes, $23@$20; average settling price, all grades of blende, $23.04.

Lead, high, $63.55; basis 80 per cent lead, $60; average settling price, all grades of lead, $59.58 per ton.

Shipments for the week: Blende, 8,113; lead, 1,308 tons. Value, all ores the week, $265,880.

Naming as a reason the possible tie-up of transportation by the threatened strike, some buyers lowered their purchases at the week end, and cut the price offering $2.50 per ton. Sales were practically all made on $25 basis, with a small tonnage bought today on $24.

A survey indicates that a few large mills recently closed down have reduced the production to a greater degree than has been compensated for by the ten or a dozen mines long idle that have resumed work, principally for the production of lead. As low as 5,500 tons output per week is shown by one survey, and none exceed 6,000 tons. The duction of lead. As low as 5,500 tons per week. Those closed were producing no lead and could no longer produce zinc ore on the market offerings, owing to the mine faces showing a lower grade of ore.

Platteville, Wis., Oct. 22—Blende, basis 60 per cent zinc, $30. Lead ore, basis 80 per cent lead, $62 per ton. Shipments for the week: Blende 87 tons. Shipments for the year: Blende 8,708; lead, 1,565 tons. Shipped during the week to separating plants, 670 tons.

Non-Metallic Minerals

Generally dull markets also exist for the non-metallic minerals, and there is no quotable change in the following from the prices published in our Oct. 15 issue: Asbestos, Barytes, Bauxite, Borax, Chalk, China Clay, Emery, Fluorspar, Fuller's Earth, Graphite, Gypsum, Kaolin, Limestone, Magnesite, Mica, Monazite, Phosphate Rock, Pumice Stone, Pyrites, Silica, Sulphur, Feldspar, and Talc.

Mineral Products

The prices of Arsenic, Sodium Nitrate, Sodium Sulphate, and Potassium Sulphate are unchanged from the quotations published in these columns Oct. 15.

Ferro-Alloys

No quotable changes have taken place in the following ferro-alloys from the prices quoted in the Oct. 15 issue: Ferrotitanium, Ferrocerium, Ferrochrome, Ferromanganese, Ferromolybdenum, Ferrosilicon, Ferrotungsten, Ferro-Uranium, and Ferrovanadium.

Metal Products

Yellow Metal — Dimension sheets, 17.25c. per lb.; sheathing, 16.25c.; and rods, ⅜ to 3 in., 14.25c.

Copper Sheets and Wire, Lead Sheets, Nickel Silver, and Zinc Sheets are unchanged from the quotations given in the Oct. 15 issue.

Refractories

Prices on the following are unchanged from the figures published in the Oct. 15 issue: Bauxite Brick, Chrome Cement, Chrome Brick, Fire Brick, Magnesite Brick, and Silica Brick.

The Iron Trade

Pittsburgh, Oct. 25, 1921

The steel market shows no signs of having increased in activity in the last week or two, and the prospect now is that there will be no material change in the near future. Production, measured by steel ingots, continues at the rate of 35 per cent, or a trifle more, of capacity, this representing an increase of about 75 per cent from the lowest rate, struck at the middle of last July.

Steel prices are showing no material change. Bars, shapes, and plates can be bought from some mills at about 1.60c., if the order is attractive, though the Carnegie Steel Co. and some independents adhere to 1.65c. for bars and 1.75c. for shapes and plates. Tubular goods are fairly steady at the Sept. 16 lists. Wire products in small lots go at the advanced prices of Sept. 22, but on large orders there seems to be some reversion to the previous prices. In sheets nearly all independents have announced an advance, but purchases can easily be made at old prices, 2.25c. to 2.50 for blue annealed, 3c. for black, and 4c. for galvanized.

Pig Iron—The market has continued dull. Prices are quotable as formerly: Bessemer, $20; basic, $19.25@$20; foundry, $21, f.o.b. Valley furnaces, freight to Pittsburgh being $1.96.

Coke

Connellsville—Furnace, $3.35@$3.50; foundry, $4.25@$4.75 per ton.

The Anglo-American Corporation of South Africa

Its Organization, Resources, and Operations*

THE ANGLO-AMERICAN CORPORATION of South Africa was organized in the latter part of 1917, with an authorized capital of £2,000,000, subsequently increased to £4,000,000, in shares of £1 each, of which 3,194,028 shares, fully paid, have been issued. The corporation is chiefly interested in gold mines on the Rand and diamond mines in Southwest Africa. Generally speaking, its holdings are in companies of which it is either directly or indirectly the largest shareholder and in whose direction it has a corresponding voice. In administration and technical matters the corporation works in conjunction with the Consolidated Mines Selection Co., Ltd., whose interests are essentially identical, thus constituting a "group" and thereby still further strengthening its position.

The officers of the Anglo-American Corporation, Ltd., are as follows: Permanent directors, Sir Ernest Oppenheimer and W. L. Honnold; directorate, Sir Ernest Oppenheimer (chairman), F. R. Lynch, the Hon. H. Crawford, Walter McDermott, W. L. Honnold, W. J. O'Brien, W. E. Hudson, C. H. Sabin, the Hon. H. C. Hull, and W. B. Thompson; New York committee, E. R. Stettinius (chairman), C. H. Sabin, W. L. Honnold, and W. B. Thompson.

At the beginning of 1921, the chief holdings of the corporation and its position in relation to the companies concerned were as follows:

	Capital Stock in Ordinary Shares of £1 Each		Shares Owned by Anglo-American Corporation Dec. 31, 1920	Shares Owned by Rand Selection Corporation Dec. 31, 1920
	Authorized	Issued		
Rand Selection Corporation.	650,000	600,000	542,740	.....
Brakpan Mines.....	850,000	850,000	.....	277,000
Springs Mines.....	1,500,000	1,267,236	13,044	292,722
West Springs.....	1,400,000	446,949 fully paid	21,176 fully paid	3,493 fully paid
		953,051 8s. paid	280,500 8s. paid	100,000 8s. paid
Daggafontein Mines.....	980,000	948,033	.....	85,445
Consolidated Diamond Mines of Southwest Africa	4,500,000	2,633,600	468,610 £972,200 debentures	.....

The Mines

The mines of the Rand occur along the northern rim of a synclinal fold or basin, and extend in almost unbroken continuity for a distance of about sixty miles. As boundaries are defined by vertical planes, there are both "outcrop" and "deep-level" properties, all differing more or less in size and technical features.

All the mines of the corporation are in the Far Eastern Rand district, where the basin is relatively shallow and the ore as a rule is confined to a single reef lying on a flatly dipping slate foot wall.

The ore takes the form of clearly segregated orebodies, irregular as to occurrence and shape, generally elongated in the direction of dip but with a common tendency as to pitch, of good thickness, and large enough to be stoped separately, some measuring over 2,000 ft. along the strike and more than 5,000 ft. on dip. They vary in the degree of their enrichment, both internally and comparatively, but their average tenor is fully one-third better than that of the Rand today and is approximately in accordance with the relatively high standard of the district.

At both Brakpan and Springs, about 50 per cent of the development sampled from year to year has been of profitable grade. Brakpan at a vertical depth of about 4,000 ft. is mining reef fully four miles from its outcrop, and Springs at a similar depth is mining reef about seven miles from the outcrop. As the bottom of the basin has been reached in the latter mine, a large measure of confidence is permissible in respect of future developments.

Regarding operating factors, it is to be stated that there is little water underground and on the whole mining conditions are good. The price of supplies is high, but water for power and for milling, as well as for domestic consumption, is comparatively cheap. Coal and electric power are obtainable at unusually low cost. Labor conditions have been somewhat upset by the after effects of the war, which is more true of white than of colored labor, but in both classes of labor a more reasonable attitude is to be noted.

Taxation laws are not burdensome on the corporation, as no tax is paid on income from companies already taxed. Both the normal tax and the dividend tax on the mines is at the até of 1s. 6d. per pound sterling.

For the present, the gold mines benefit through the premium on gold, which in the corporation mines roughly offsets the increase in working costs due to the war. The premium, of course, will disappear with the return of normal exchange, but apart from this being a remote contingency, it is expected that its disappearance will be accompanied by a decrease in working costs and an increase in earnings.

The Rand Selection Corporation

The holdings of the Rand Selection Corporation, Ltd., include 277,000 shares in Brakpan Mines and 292,722 shares in Springs Mines, thus making it the largest shareholder in these companies; 3,493 fully paid and 100,000 partly paid shares in West Springs, and 85,445 fully paid shares in Daggafontein Mines, both of which are still in the development stage. Also, the freehold of the farms Brakpan and De Reitfontein, as well as Brakpan and Springs townships.

The dividends paid during the last five years have been as follows: 1916, 27½ per cent, or 5s. 6d. per share; 1917, 30 per cent, or 6s. per share; 1918, 35 per cent, or 7s. per share; 1919, 10 per cent, or 2s. per share; also eight enemy shares per 100 shares legally held; 1920, 27½ per cent, or 5s. 6d. per share; 1921, 15 per cent, or 3s. per share for the first half year.

Brakpan Mines, Ltd.

The total area of the Brakpan Mines property is 3,387 claims, about 5,000 acres, all of which is underlain by the reef formation. Of this area, 1,812 claims were acquired under lease from the government in 1916 and incorporated in the company on the following terms:

1. The company to pay the government 5 per cent of the annual profits of the amalgamated property during a period of five years from Jan. 1, 1917.

2. Thereafter, a percentage of the profit according to the formula $Y = 50 - \frac{1,150}{x}$, the minimum percentage payable being 12½ per cent. In this formula "Y" represents the ratio of profit to recovery expressed as a percentage, and "x" the percentage of the profit accruing to the government.

Brakpan is now crushing above 50,000 tons per month, and its remaining life is estimated at about twenty years. This estimate contemplates an increase in the rate of crushing as soon as ore can be drawn in sufficient quantity from two new shafts which have already reached the reef.

The developed ore in reserve, in combination with that normally obtained from current development and other incidental sources, is equivalent to about five years' supply at the present rate of crushing.

The recovery value of the ore reserve, after including the ore normally obtained from current development and other incidental sources, and allowing for sorting and loss in treatment, is estimated at 8.18 dwt. per ton milled, equivalent to 34s. 6d., plus such gold premium as may be realized.

In 1920, the average recovery per ton was 35s. 11d., plus 11s. 6d. on account of gold premium. Working costs in the same year averaged 29s. 5d. per ton, which was 11s. 5d. above the average of 1915.

*This information was obtained by *Engineering and Mining Journal* directly through the kindness of Mr. W. L. Honnold, director in the corporation.

The dividends paid during the last five years have been as follows: 1916, 45 per cent, or 9s. per share; 1917, 47½ per cent, or 9s. 6d. per share; 1918, 32½ per cent, or 6s. 6d. per share; 1919, 27½ per cent, or 5s. 6d. per share; 1920, 45 per cent, or 9s. per share; 1921, 15 per cent, or 3s. per share for the first half year. No increase of capital is contemplated, as the milling plant has already been enlarged to 75,000 tons per month capacity, and the capital expenditure due to opening the new areas is being met out of profits.

Springs Mines

The area of Springs Mines, Ltd., is 3,568 claims, about 5,350 acres, all underlain by the reef formation. Of this area, 2,235 claims were leased from the government in 1917 and incorporated in the company on the following terms:

1. The company to pay the government 5 per cent of the annual profits of the amalgamated property during a period of five years from Jan. 1, 1918.

2. Thereafter, a percentage of the profit according to the formula $Y = 55 - \frac{1,175}{x}$, the minimum percentage payable being 12½ per cent, and the unknown quantities of the same significance as in the Brakpan formula.

The company is crushing about 40,000 tons per month, which will be increased to 50,000 tons per month as soon as additional plant now under construction is completed. The remaining life of the mine is estimated at about twenty years, and this estimate contemplates increasing the crushing rate from time to time as ore can be taken from the two new shafts, one of which has already reached the reef.

The developed ore in reserve, in combination with that normally obtained from current development and other incidental sources, is equivalent to about six years' supply at the present rate of crushing. The recovery value of this ore, allowing for sorting and loss in treatment, is estimated at 8.81 dwt. per ton milled, equivalent to 37s. 2d., plus such gold premium as may be realized. In 1920 the average recovery per ton was 37s. 10d., plus 11s. 10d. gold premium. Working costs in 1920, averaged 30s. 9d. per ton, which was 8s. ½d. above the average of 1917.

The dividends paid since milling was started are as follows: 1918, 12½ per cent, or 2s. 6d. per share, also one West Springs share to every holder of ten Springs Mines shares; 1919, no dividend, but £349,272 appropriated to working capital; 1920, 20 per cent, or 4s. per share; 1921, 7½ per cent, or 1s. 6d. per share for the first half year.

West Springs, Ltd.

The property of this company includes 2,235 claims, about 3 350 acres, all underlain by reef formation. The whole of this area is operated under a lease from the government, which provides that the government's percentage of the profit will be calculated according to the formula $Y = 65 - \frac{650}{x}$, the unknown quantities having the same significance as in the Brakpan formula. Under this arrangement, if the ratio of profit to recovery does not exceed 10 per cent, nothing is payable to the government. This, after allowing for amortization and ordinary taxation, is equivalent to about 8 per cent free of income tax for the shareholders before anything is payable to the government.

Two shafts are being sunk, one of which has already reached the reef, and connecting haulageways are being driven from Spring Mines. Good ore has been encountered, and, generally speaking, conditions so far disclosed conform with those in the adjoining mines. It is expected that crushing will begin about two years hence. This company's ground lies between Brakpan Mines and Springs Mines. The life of the mine promises to approximate that of its neighbors.

Daggafontein Mines, Ltd.

As noted in the tabulation of holdings, the Anglo-American Corporation owns no shares in Daggafontein Mines, Ltd., but has recently become indirectly interested through the Rand Selection Corporation. The property includes 2.059 claims, about 3,100 acres, all underlain by reef. The work first undertaken was unfortunately located, but a new shaft situated nearer to Springs Mines has recently cut the reef and encountered good ore. Further development promises to improve the position, it is stated, but it will first be necessary to reorganize the company, pending which step work has been suspended.

Consolidated Diamond Mines of Southwest Africa, Ltd.

This company owns practically all the known diamond mines of Southwest Africa, as well as important rights in respect of new discoveries that may be made. The diamonds occur in alluvial deposits, and the ground has been thoroughly tested. The estimates made assure a long life, say forty years, under what would now be termed average conditions.

In size, the diamonds, though small, are of desirable dimensions. They are of unusually fine quality and cut to good advantage. The fields lie mainly in valleys close to and roughly parallel to the coast, and the principal ones occur within an area extending longitudinally about sixty miles. The country generally is bare and rugged. The basal rock is generally gneissic in character and of Archean age, though further south ancient sedimentary rocks come increasingly into evidence. In the Pomona district, flat-topped hills, or "tafelberg," standing 300 ft. above the surrounding valleys, are features of the landscape. These hills are clearly uneroded portions of a former table land. Diamonds in payable quantity are found on them, in a capping of cemented rubble. On one of them there is an ancient river bed containing cemented river gravel, carrying diamonds in payable quantity to a depth of about eight feet. These occurrences are of relatively minor importance, but are interesting as bearing on the question of the original source of the diamonds in the valleys below.

The known workable deposits occur mainly in the valleys, and fortunately are of such extent and richness that the question of original source is not of importance, since the official estimates of the quantity of diamonds developed show a total of about 15,000.000 carats.

Broadly speaking, it is probable that the diamond-bearing gravels will average about ¼ of a carat of diamonds per cubic yard of raw material. In working the gravel, the usual procedure in the case of shallow deposits is to dry-screen in the field with hand trommels, and then to transport the remainder to wet-treatment plants to be jigged and hand-picked for diamonds. Secondary picking may follow in combination with magnetic separation of the associated minerals. The treatment is not necessarily complete, for the material eliminated may possibly carry diamonds. Secondary working, therefore, is often justified, and, in fact, certain sections have been worked over as many as five times. Sea water is used where required for concentration, and electric power is provided by a central generating plant at Luderitzbucht. The water for drinking and domestic requirements is either condensed from sea water or transported by rail from inland wells. These fields, however, will soon be supplied from wells nearer by. With a view to improving the position as to the sale of diamonds, a conference of the four large South African producers was held during the latter part of 1919. This conference resulted in an inter-producers' agreement, fixing the quantity of diamonds to be marketed and the quota to be allotted to the respective producers, and a sales agreement with the London Diamond Syndicate. In 1920 this arrangement has worked out as follows for the Consolidated Diamond Mines of Southwest Africa, Ltd.:

	Quota £	Basis Price £ s. d.
First quarter	619,580	5 12 4
Second quarter	630,000	7 4 7
Third quarter	540,330	8 4 4
Fourth quarter	275,583	8 9 5

Working costs vary under different conditions. The production cost per carat in 1920 was approximately £1 4s., but last year's scale of operations was above normal requirements, so that costs were consequently lower than they would otherwise have been. Under the scheme of taxation the government pays 70 per cent of the working costs.

MINING STOCKS

Week Ended October 22, 1921

Stock	Exch.	High	Low	Last	Last Div.	
COPPER						
Ahmeek	Boston	53	48	53	Sept. '20, Q	$0.50
Alaska-Br. Col.	N. Y. Curb	*40	*36	*38		
Alloues	Boston	21	20½	21	Mar. '19	1.00
Anaconda	New York	39½	38½	39½	Nov. '20, Q	1.00
Arcadian Consol.	Boston	2¼	2	2		
Ariz. Com'l	Boston	8¾	8½	8½	Oct. '18, Q	.50
Big Ledge	N. Y. Curb	*35	*29	*34		
Bingham Mines	Boston	13¾	15½	13¾	Sept. '19, Q	.25
Calumet & Arizona	Boston	49¼	48½	48¾	Sept. '21, Q	.50
Calumet & Hecla	Boston	240½	236	236	June '20, Q	5.00
Canada Copper	N. Y. Curb	*31	*28	*29		
Centennial	Boston	9	9	9	Dec. '18, SA	1.00
Cerro de Pasco	New York	29¾	28	29	Mar. '21, Q	.50
Chile Copper	New York	11¼	11¼	11¼		
Chino	New York	24¾	24	24¾	Sept. '20, Q	.37½
Columbus Rexall	Salt Lake	*15½	*14	*14		
Con. Arizona	N. Y. Curb			*1	Dec. '18, Q	.05
Con. Copper Mines	N. Y. Curb	1¼	1	1¼		
Copper Range	Boston	34	33¼	33¾	Sept. '20, Q	.50
Crystal Copper	Boston Curb	*35	*22	*32		
Davis-Daly	Boston	7	6¼	6¾	Mar. '20, Q	.25
East Butte	Boston	9¼	9	9¼	Dec. '19, A	.50
First National	Boston Curb	*80	*75	*75	Feb. '19, SA	.15
Franklin	Boston	2¼	2	2		
Gadsden Copper	Boston Curb	*45	*40	*40		
Granby Consol.	New York	19¾	18	18	May '19, Q	1.25
Greene-Cananea	New York	22¼	22¼	22¼	Nov. '20, Q	.50
Hancock	Boston	2¼	2¼	2¼		
Howe Sound	N. Y. Curb	2¼	2¼	2¼	Jan. '21, Q	.05
Inspiration Consol.	New York	34½	33¼	34½	Oct. '20, Q	1.00
Iron Cap	Boston Curb	5¼	5¼	5¼	Sept. '20, K	.25
Isle Royale	Boston	21½	20	20	Sept. '19, SA	.50
Kennecott	New York	21¼	20¾	21¼	Dec. '20, Q	.50
Keweenaw	Boston	1	1	1		
Lake Copper	Boston			2¼		
La Salle	Boston			1½		
Magma Chief	N. Y. Curb			*8		
Magma Copper	N. Y. Curb	*22	*21½	*21½	Jan. '19, Q	.50
Majestic	Boston Curb	†*7	†*6	*6		
Mason Valley	Boston	1¾	1¾	1¾		
Mass Consolidated	Boston	2¾	2¼	2¾	Nov. '17, Q	1.00
Miami Copper	New York	22¼	21¾	22¼	Aug. '21, Q	.50
Michigan	Boston	2¼	2¼	2¼		
Mohawk	Boston	51	50	50	Nov. '20, Q	1.00
Mother Lode Coa.	N. Y. Curb	6	5	5¼		
Nevada Consol.	New York	11¾	11¼	11¾	Sept. '20, Q	.25
New Baltic	Boston Curb			3		
New Cornelia	Boston	14¼	14¼	14½	Aug. '20, K	.25
North Butte	Boston	10¼	10	10	Oct. '18, Q	.25
North Lake	Boston			*30		
Ohio Copper	N. Y. Curb	*6	*6	*6		
Old Dominion	Boston	23½	23½	23½	Dec. '18, Q	1.00
Osceola	Boston	27½	27½	27½	June '20, Q	.50
Phelps Dodge	Open Mar.	‡			Oct. '21, Q	1.00
Quincy	Boston	38	36	36	Mar. '20, Q	1.00
Ray Consolidated	New York	13	12¾	12¾	Dec. '20, Q	.25
Ray Hercules	N. Y. Curb	*27	*20	*25		
St. Mary's Min. Ld.	Boston	36¼	36¼	36½	June '20, K	2.00
Seneca Copper	Boston			13¼		
Shannon	Boston			1¼	Nov. '17, Q	.25
Shattuck Arizona	New York	6¾	6½	6½	Jan. '20, Q	.25
South Lake	Boston			1		
Superior & Boston	Boston	1¼	1¼	1¼		
Tenn. C. & C. cfs	New York	7¼	7¼	7¼	May '18, I	1.00
Tuolumne	Boston	*42	*37	*38	May '13,	.10
United Verde Ex.	Boston Curb	27	25	27	May '21, Q	.25
Utah Consol.	Boston	3	3	3	Sept. '18,	.25
Utah Copper	New York	52¾	50¼	52¼	June '21, Q	.50
Utah Metal & T.	Boston	1¾	1¼	1¾	Dec. '17,	.30
Victoria	Boston			1¼		
Winona	Boston			*50		
Wolverine	Boston			11		
NICKEL-COPPER						
Internat. Nickel	New York	13¼	13⅛	13¼	Mar. '19,	.50
Internat. Nickel, pf.	New York			74¼	Aug. '21, Q	1.50
LEAD						
National Lead	New York	75	74½	74½	Sept. '21, Q	1.50
National Lead, pfd.	New York	104	103	103	Sept. '21, Q	1.75
St. Joseph Lead	New York	12¾	12¼	12¼	Sept. '21, Q	.25
QUICKSILVER						
New Idria	Boston			*50		
ZINC						
Am. Z. L. & S.	New York	9¾	9	9¼	May '20,	1.00
Am. Z. L. & S. pfd.	New York	32	32	32	Nov. '20, Q	1.50
Butte C. & Z.	New York	4¾	4¼	4¾	June '18,	.50
Butte & Superior	New York	14	13¼	13¼	Sept. '20,	1.25
Callahan Zn-Ld	New York	4	3¾	4	Dec. '20, Q	.50
New Jersey Zn	N. Y. Curb	126	124	126	Aug. '21, Q	2.00
Success	N. Y. Curb			2	July '16,	.03
Yellow Pine	Los Angeles			*55	Sept. '20, Q	.03

Stock	Exch.	High	Low	Last	Last Div.	
GOLD						
Alaska Gold	New York	¼	¼	¼		
Alaska Juneau	New York	¼	¼	¼		
Carson Hill	Boston	14¼	13¾	13¾		
Cresson Consol. G.	N. Y. Curb	1⅛	1⅛	1⅛	June '20, Q	$0.10
Dome Extension	Toronto	*65				
Dome Mines	New York	18¼	17¼	18¼	Oct. '21, Q	.25
Florence Goldfield	N.Y. Curb	*50	*40	*42		
Golden Cycle	Colo. Springs	*69	*67	*67	June '21, Q	.02
Goldfield Consol.	N. Y. Curb			*3	Dec. '19,	.05
Hollinger Consol.	Toronto	7.45	7.36	7.40	Oct., '21, 4 wks.	.05
Homestake Mining	New York	56	55½	56	Sept. '21, M	.25
Kirkland Lake	Toronto	*37	*30	*34		
Lake Shore	Toronto	1.25	1.14	1.21	Aug. '21, K	.02
McIntyre-Porcupine	Toronto	1.92	1.91	1.90	Sept. '21, K	.05
Porcupine Crown	Toronto	*14	*10	*11½	July '17,	.03
Porcupine V. N. T.	Toronto	*19	*16	*16½		
Portland	Colo. Springs	*38	*38	*38	Oct. '20, Q	.01
Reorgan. Booth	N. Y. Curb			*4	May '19,	.05
Schumacher	Toronto	*26	*20	*24		
Silver Pick	N. Y. Curb			*8		
Teck Hughes	Toronto	*16½	*15	*16		
Tom Reed	Los Angeles	*61	*50	*50	Dec. '19,	.02
United Eastern	N. Y. Curb	2 1/16	2¼	2 1/16	July '21, Q	.15
Vindicator Consol.	Colo. Springs	*24	*22	*24	Jan. '20, Q	.01
White Caps Mining	N. Y. Curb			*7		
Yukon Gold	N. Y. Curb	1¼	1¼	1¼	June '18,	.02½
SILVER						
Arizona Silver	Boston Curb	*19	*19	*19	Apr. '20, M	.03
Batopilas Mining	New York			¼	Dec. '07, I	.12½
Beaver Consol.	Toronto	*25½	*23¾	*25¼	May '20, K	.03
Coniagas	Toronto	1.50	1.00	1.50	May '21, Q	.12½
Crown Reserve	Toronto	*13	*11	*13	Jan. '17,	.05
Kerr Lake	N. Y. Curb	3¼	3¼	3¼	Oct. '21, Q	.12½
La Rose	Toronto	*37	*33¾	*34¼	Apr. '18,	.02
McKinley-Dar.-Sav.	Toronto	*23	*20	*20	Oct. '20, Q	.03
Mining Corp. Can.	Toronto	1.15	1.12	1.15	Sept. '20, Q	.12½
Nipissing	N. Y. Curb	5¼	5	5¼	Oct. '21, Q	.03
Ontario Silver	New York	4¼	4¼	4¼	Jan. '19, Q	.50
Ophir Silver	N. Y. Curb			*11	Jan. '12,	.10
Temiskaming	Toronto	*22	*21	*22	Jan. '20, K	.04
Trethewey	Toronto	*12½	*11	*12½	Jan. '19,	.05
GOLD AND SILVER						
Barnes-King	Butte			*60	Aug. '20, Q	.05
Boston & Montana	N. Y. Curb	1¼	*92	*98		
Cash Boy	N. Y. Curb	*5	*5	*5		
Consol. Virginia	San Francisco	†36	†*34	*36		
Dolores Esperanza	N. Y. Curb	1¼	1¼	1¼		
El Salvador	N. Y. Curb	*18	*16	*17		
Jim Butler	N. Y. Curb			*7	Aug. '18, SA	.07
Jumbo Extension	N. Y. Curb			*3	June '16,	.05
Louisiana Con	N. Y. Curb			½		
MacNamara M.& M.	N. Y. Curb	*15	*12	*14	May '10,	.02½
N. Y. Hond. Rosar.	Open Mar.			4	Jan. '21, Q	.30
Tonopah-Belmont	N. Y. Curb	1 1/16	1 1/16	1 1/16	Apr. '21, Q	.05
Tonopah-Divide	N. Y. Curb	*73	*67	*70		
Tonopah-Extension	N. Y. Curb	1¼	1¼	1 1/16	Oct. '21, Q	.05
Tonopah Mining	N. Y. Curb	1¼	1 1/16	1 1/16	Oct. '21, SA	.05
West End Consol.	N. Y. Curb	*96	*89	*95	Dec. '19, SA	.05
SILVER-LEAD						
Caledonia	N. Y. Curb			*7	Jan. '21, M	.01
Cardiff M. & M.	Salt Lake	1.05	1.02½	1.02½	Dec. '20,	.15
Chief Consol.	Boston Curb	3¼	2¾	3¼	Aug. '21, Q	.05
Consol. M. & S.	Montreal	19¼	19	19	Oct. '20, Q	.62½
Daly Mining	Salt Lake	†3.00	†1.00		July '20, Q	.10
Daly-West	Boston	2	1¾	2	Dec. '20, Q	.25
Eagle & Blue Bell	Boston Curb	†3	†2½	2	Apr. '21, K	.05
Electric Point	Spokane	*7	*6	*6	May '20, SA	.03
Eureka-Croesus	N. Y. Curb	*40	*36	*39		
Federal M. & S.	New York			7½	Jan. '09,	1.50
Federal M. & S., pfd	New York	25	25	24¾	Sept. '21, Q	1.00
Florence Silver	Spokane	*8	*8	*8	Apr. '19,	.01½
Grand Central	Salt Lake		†*10		June '20, K	.03
Hecla Mining	N. Y. Curb	4¼	4	4¼	Sept. '21, Q	.10
Iron Blossom Con.	N. Y. Curb	*17	*17	*17	Apr. '20, Q	.02½
Judge M. & S.	Salt Lake	†3.00	†1.65		Sept. '20, Q	.12½
Marsh Mines	N. Y. Curb	*4	*3	*3	June '21, I	.02
Prince Consol.	Salt Lake	*7	*7	*7½	Nov. '17,	.02½
Rambler-Cariboo	Spokane	*2	*2	*2	Feb. '19,	.01
Rex Consol.	N. Y. Curb	*10	*8	*9		
South Hecla	Salt Lake	†*40	†*20		Sept. '19, K	.15
Standard Silver-Ld.	N. Y. Curb	*10	*10	*10	Oct. '17,	.05
Stewart Mining	N. Y. Curb	*4	*4	*4	Dec. '15	.05
Tamarack-Custer	Spokane	1.90	1.85	1.90	Jan. '21 K	.04
Tintic Standard	Salt Lake	1.92½	1.87½	1.90	July '21, Q	.05
Utah Apex	Boston	2¼	2¼	2¾	Nov. '20, K	.25
Wilbert Mining	N. Y. Curb	*2	*2	*2	Nov. '17,	.01
VANADIUM						
Vanadium Corp.	New York	30½	29½	30½	Jan. '21, Q	1.00
ASBESTOS						
Asbestos Corp.	Montreal	53	47½	53	Oct. '21, Q	1.50
Asbestos Corp., pfd.	Montreal			70½	Oct. '21, Q	1.75
MINING, SMELTING AND REFINING						
Amer. Sm. & Ref.	New York	36¼	35¾	36¼	Mar. '21, Q	1.00
Amer. Sm. & Ref. pf	New York	75	74	74¼	Sept '21, Q	1.75
Am. Sm. pf. A	New York	78	77½	77¼	Oct. '21, Q	1.50
U. S. Sm. R. & M.	New York	32	31½	32	Jan. '21, Q	.50
U.S.Sm.R.& M. pf.	New York	42½	39¼	39½	July. '21, Q	.87

*Cents per share. †Bid or asked. ‡Quotations missing Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra.

Toronto quotations courtesy Hamilton B. Wills; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Los Angeles, Chamber of Commerce and Oil; Colorado Springs, The Financial Press, N. Y.